INDEX NUMBER

the Journal

of the association for physical and mental rehabilitation

CORRECTIVE THERAPY

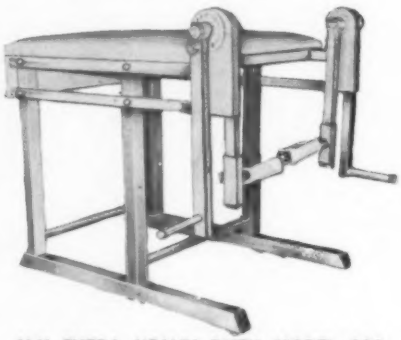
NOVEMBER–DECEMBER, 1961 VOL. 15 NO. 6

PRESTON

A VALUABLE AID

For the Most Effective and Time-saving Administration of P.R.E. to the Quadriceps and Hamstrings Muscles

N-K STANDARD MODEL 100B



N-K EXTRA HEAVY DUTY MODEL 300

A number of exclusive patented features in the N-K Table make it one of the most important exercise units in every rehabilitation program.

Time Saving: To operate, simply set the weight arm in position and place the weight on it. The patient places his leg behind the leg rest and begins exercising. There is no need to add weights to give the conventional ½, ¾ and full resistance; the Therapist simply moves the weight on the calibrated arm to the next notch!

Variable Resistance Patterns: By simply changing the angle between the two lever arms, many different resistance patterns may be selected, such as —

(1) Maximum resistance at beginning of range diminishing gradually to zero resistance at full extension.

(2) Maximum resistance during middle phase of the range and diminishing resistance at either end. (This is the most frequently used N-K technique.)

(3) Minimum resistance at beginning and increasing to maximum at full extension. (This is the same pattern as you have when using a weighted boot.)

It is frequently observed that patients cannot achieve full knee extension with weights attached to the feet or when using friction or hydraulic resistance devices. The N-K unit overcomes this difficulty: It permits the very important last 15-20 degrees of extension to be exercised against diminishing resistance for a complete range of motion. This patented feature is possible only with a two-lever unit using weights for resistance.

ORDER BY CATALOG NUMBER:

PC 2251A N-K Unit Standard Model 100B — Consists of sturdy all-welded chrome table with upholstered top — 30"x36"x30" high and the chrome-plated torque unit which can be placed on left or right of table as needed. **$199.50**

PC 2251AD N-K Unit Extra Heavy Duty Model 300 — Includes all the unique features of the Standard N-K 100B Table plus greatly increased resistance potential. Comes with two permanently mounted torque units and interchangeable weight holders of 6", 8" and 12" length. Table is 36"x34"x30" high, chrome plated and upholstered. **$365.00**

J. A. PRESTON CORPORATION

71 Fifth Avenue, New York 3, New York

The Journal of the Association for Physical and Mental Rehabilitation
SEPTEMBER – OCTOBER, 1961

VOLUME 15 No. 6

Published Bimonthly
by the Association for
Physical and Mental Rehabilitation
105 St. Lawrence Street
Rehoboth Beach, Delaware

in this issue

SUBSCRIPTION RATES

Subscription to the Journal is included in Active, Professional, and Associate memberships.
Subscriptions to libraries and organizations $5.00
Foreign $5.50
Single Copies $1.00

Address all requests for subscriptions to:
Circulation Manager,
Box 478, Montrose, N. Y.

ARTICLES

DEPARTMENTS

THE JOURNAL OF THE ASSOCIATION FOR PHYSICAL AND MENTAL REHABILITATION

Information For Contributors

MANUSCRIPT: Manuscripts should not exceed ten (10) typewritten pages; approximately 5,000 words. Manuscripts must be the original copy, not a carbon, typed double-spaced with margins of one (1) inch for large type and one and a half (1½) inches for the small.

STYLE: Prepare manuscripts in conformity with the general style of the Journal. Retain a copy of the manuscript and duplicates of all tables, figures, charts for future use should originals be lost in the mails.

ILLUSTRATIONS: Drawings and charts should be made with India ink for photographic reproductions as zinc etchings. Photographs must be 8 x 10 inches, high contrast, black and white, glossy prints. Printed captions and related information referring to photographs, must be typed and attached to the bottom of the photograph. In accepting an article for publication the association agrees to defray the costs of one (1) photo engraving or line cut used for illustration purposes. Cost of additional engravings must be charged to the author.

REFERENCES: References in the text should be identified by number, *i.e.*, "As Observed by Kendall and Jones (4). All references should be listed at the end of the article in numerical sequence. The following order and punctuation should be observed: Kendall, B.S. and J.E. Jones, Resume of Treatment of Brain-Damaged Cases. *Arch. Neurol. and Psychiat.*, 71:247, June, 1948.

Send all manuscripts to the Editor, Box 478, Montrose, N. Y.

REPRINTS: Should be ordered when manuscript is submitted. They may be purchased at the following prices:

No. Pages	100	200	300	400	500	1 M	100 Add.
1	$ 8.15	$ 9.70	$10.95	$12.20	$13.45	$18.75	$ .95
2	11.55	13.15	14.70	16.25	17.80	24.70	1.25
3 - 4	14.70	16.90	19.05	21.25	23.15	32.50	1.90
5 - 8	23.15	33.15	44.40	50.65	56.90	81.25	5.00

REPRESENTATIVE ASSEMBLY

Eastern N.Y.—William H. Middleton, 1154 E. 229th St., Bronx.

West N.Y.—Richard F. Bergstrom,V.A.H., Buffalo.

Mid Atlantic—George M. Kilmer, V.A.H., Ft. Howard, Md.

Mid-West—Leslie M. Root, 2142 N. 61 St., Wauwatosa 31, Wisc.
Paul E. Conte, 1645 McKay St., Waukegan, Ill.
John Sikich, 1389 Stanley Blvd., Calumet City, Ill.

Northwest—Samuel G. Hewston, V.A.H., American Lake, Wash.

Calif.-Nevada—Zane E. Grimm, 1924 Great Highway, San Francisco.
Evelyn Loewendahl, 1755 Correa Way Los Angeles.

Central States—Harvey A. Toles, 5034 Derby Rd., Dayton 18, Ohio.

New Eng.—Daniel Bennett, 97 Highland St., Brockton, Mass.

So. East—James M. Field, V.A.H., Durham, N.C.
Paul B. Bell, 1143 Getwell, Memphis, Tenn.
John M. Tanzine, 1703 Highland, Dublin, Ga.

Texas-La.—Karl K. Klein, 1500 E. 34th St., Austin 2, Texas.

Ht. of America — Robert O. Swengel, 2605 Murrow Ct., Topeka, Kans.

Grand Canyon—Henry White, 2142 Terra Suida Drive, Salt Lake City, Utah.

ELEMENTS RELATING TO THE EFFECTIVENESS OF PROGRAMS FOR REHABILITATING PSYCHOTIC PATIENTS*

RICHARD L. JENKINS, M.D.**

Important elements relating to the effectiveness of programs for rehabilitating psychotic patients include:

1) The nature of the programs and how they are carried out.
2) The setting in which they are carried out.
3) What kind of psychotic patients are being rehabilitated.

It is this last variable which, by complicating the process, renders the estimate of the first and second variables so difficult. The Veterans Administration undertook a five-year study, the Psychiatric Evaluation Project, to provide information as definitive as possible concerning the hospital factors relating to success in treating psychotic patients.

Patients vary so much one from another as to make difficult the effective comparison of methods of treatment. We recognized this as a central problem in the Psychiatric Evaluation Project, in which we sought to campare the effectiveness of hospitals with different resources in treating psychotic patients.

We expended a great deal of careful work upon the control of this variable. Everyone knows that the prospect for the successful rehabilitation of patients who have been hospitalized for ten years is much dimmer than is that for patients who have been hospitalized for ten weeks. There are also important prognostic differences recognizable on admission. The Psychiatric Evaluation Project includes 12 VA NP hospitals scattered from coast to coast with local conditions about as varied as may be found within the continental United States.

We searched for and determined a number of variables in a population of male veteran patients newly admitted or newly re-admitted to these 12 VA NP hospitals with a diagnosis of schizophrenia. Our best criterion variable to check these predictions proved to be the number of days the patient spent in the community during the first two years after his admission or readmission. Our intake of cases was during 1956 and 1957, and the proportion of patients who were re-admissions to the hospital was quite large at that time. That is to say, we were studying a population with a large fraction of patients who had had previous psychiatric hospitalization.

It is worth emphasis that in determining in-community days during the first two years, any time a patient may have spent in jail or in penal confinement was not counted as in-community time. On the other hand, hospitalization which was not in a psychiatric hospital nor on a psychiatric ward, was counted as in-community time.

The most significant predictor of in-community days proved to be whether or not the patient was married. The married patients returned to the community more rapidly than the single patients. In their prognosis for return to the community, the divorced patients fell between those currently married and those never married, but closer to the married. We believe this finding supports the wisdom of the ancient proverb, "Tis better to have loved and lost than never to have loved at all."

The next best predictor puts in one group the patients who have had previous psychiatric hospitalization within a calendar year and in the other group those who have never previously had a psychiatric hospitalization or, if they have had such hospitalization, have not had it within the year. This second group is the more favorable.

The third predictor is a combination based on interview ratings of the patient's motivation, on his having post-hospital goals and an absence of apathy.

The fourth predictor is the degree to which the patient's behavior on the ward is disordered. This is based on eight items of behavior. For example, if he does not need help in sticking to activities, if he reads newspapers and magazines, if he chats with other patients the outlook is more favorable than if the contrary is true.

The fifth predictor is the presence of anxiety as reported by the patient and reflected by his appearance and behavior, in his expressed desire for treatment and in his complaints. Anxiety is a factor favorable to early return to the community.

The sixth predictor is the extent to which the patient revealed a schizophrenic psychosis in inter-

*The author wishes to express his appreciation to the Veterans Administration, to the staff of the Psychiatric Evaluation Project and to the present Project Director, Dr. Lee Gurel, for the material on which this paper is based. These are some of the preliminary results based on the 12 hospitals in the Project. The collection of data is continuing.

**At present, Chief, Child Psychiatry Service, State Psychopathic Hospital, University of Iowa.

view, and it centers particularly on the extent of the disorganization of his thinking.

The seventh factor is the patient's relatedness, or lack of it, as reflected in interview ratings of his cooperation and rapport as compared with evasiveness and withdrawal.

The eighth factor is the length of the patient's last job, with employment of a year or more indicating the favorable end. Closely related to this is the ninth factor, the number of jobs since service, with three or more favorable.

The tenth factor is depression, as manifested and as reported by the patient. In schizophrenic patients, depression is a favorable sign.

The eleventh and last factor is history of length of residence in the community. Here less than eight years residence is more favorable than eight years or more. Perhaps in our mobile age long residence in one community may in some instances reflect dependance or rigidity rather than independance or flexibility.

From this combination of eleven predictors we are able to develop multiple correlation of .392. This is highly significant, but it accounts for only 15% of the variance of in-hospital days. We spread our net widely in seeking bits of information about patients which might predict in-community days, and we investigated a total of 246 items of which 113 proved to be predictive. And yet it is clear that the best prediction we can make of the duration of the patient's hospitalization at his admission accounts for only a rather small fraction of the observed range of hospital stay. How he is treated in the hospital of course accounts for another fraction.

If we turn now to the hospital variables we are handicapped by the fact that while our study includes nearly 1,200 schizophrenic patients, it includes only 12 hospitals, and as a consequence, chance factors are important. We find that the advantage lies with the hospitals with the newer architecture and smaller nursing units, with the smaller hospitals in general and with the better staffed hospitals in general, particularly those which are well staffed with social workers and well staffed with psychiatrists. Of course these are also hospitals with high per diem cost.

Now I believe that from these findings we can recognize to a large extent the needs of schizophrenic patients. These patients need the interest of others. They need motivation, and they must be drawn out, not driven in. The question of whether they experience the interest of others and whether they are drawn out and motivated, helped to build post-hospital goals — these questions are distinctly more important in determinining whether they stay in the hospital indefinitely or go home than is the matter of how disorganized they are on admission. We need not be afraid of making a patient anxious or even making him a bit depressed if only we don't drive him into negativism and withdrawal. The strain we are justified in putting on a schizophrenic patient in the course of his treatment is of course very dependent on how good a relationship we have with him.

If we take up the predictors of the patient's return to the community individually, the first relates to matrimony. Obviously we cannot supply the patient with a spouse or conduct a matrimonial agency for our patients. We can, however, do much to give him a feeling that he, too, has acceptance as a human being, has human dignity, that some people care about him, that what happens to him is not a matter of indifference. A protective wall of isolation is an effective defense against an un-understanding and unkind world. It is not necessary in a world that is kind and understanding, and if the patient feels it is not needed, it tends to crumble.

This brings us back to the setting in which the program of rehabilitation is carried out. During most of the last century, hospitals were built ever larger to save money, but of course building them larger made it necessary to build more of them — and this proved no saving of money. The per diem cost was less, and apparently too few people paid much attention to how the duration of the patient's hospitalization increased. The personal acquaintance of staff members and patients is important. Staff are not really robots nor are they interchangeable. Yet a larger hospital tends to push them in that direction for it tends to have a smaller proportion of patients and staff members who know each other, and consequently to be-a more impersonal hospital. No group of people react so unfavorably to impersonal treatment as schizophrenics. It confirms them in their disorganized isolation.

Of course those who work with the patient in the hospital cannot support his human needs outside the hospital. They *can* support his growth toward social adequacy inside the hospital to the end that he will be able to maintain his personal relations, and they can encourage the re-establishment of family ties. This last has often been neglected. This is, of course, the professional responsibility particularly of social workers and it is probably a reason this professional group appears so important in their influence on release rates. But while no one else should jump into the central position of working with the family, there are many opportunities for others to help in strengthen-

ing family ties. And of course the patient must be helped to a point of responsiveness at which he is able to get along with his relatives.

To turn to the second predictive factor, obviously we cannot do anything about the recency of the patient's prior hospitalization, but we can work to have him in good shape when he leaves the hospital on this occasion.

The third factor points the way in which a large part of our efforts should go — to overcome apathy, to develop motivation, to get the patient to thinking in terms of post-hospital goals. Any interest in life will reduce apathy. Any goal will establish motivation. It is for this reason that so many patients have been helped through so many different activities and by people who have related themselves to so many different goals and interests. And after goals and motivation are established, and the patient has been rewarded by the taste of success, after he begins to respect his capacity to influence his own destiny and begins to work planfully, he needs to begin to think about his personal post-hospital goals.

The fourth factor relates to disordered ward behavior. We can encourage the patient's exchange with other patients so that the friendly exchange between patients becomes a therapeutic agent. This is one of the elements of group therapy but it is by no means confined to group therapy. We try to reduce the disorder of patients' hospital behavior and encourage them in constructive directions.

The fifth factor brings one of the most delicate of decisions. An increase in anxiety is good, but an increase in withdrawal, isolation or evasiveness is bad. A program that requires nothing creates no anxiety. Pressures for performance create anxiety — and the capacity of the schizophrenic patient to perform is often very low and his frustration tolerance is usually very low. As the treatment relationship develops, the therapist begins to put increasing gentle pressure on the patient. But this must not be overdone, and the patient must not be permitted to fail, lest he withdraw and cease trying. Each success should be used as an occasion to seek to build up his self-confidence. Always we must remember the proof of the pudding is in the eating. If the patient couldn't take it, it was too much — at least in the way it was given.

Regarding the sixth factor, the schizophrenic psychosis, our attack is indirect. In general, we ignore his psychological malfunctioning and work with the positive aspects of his behavior.

The seventh factor on the other hand is a direct point of attack. We seek to increase the patient's rapport and cooperation and to diminish his evasion and withdrawal by going out to him. And yet as John Whitehorn has pointed out we must be very cautious lest we move in too rapidly on a schizophrenic. He wants human relations, although often he does not realize this, and he is likely to withdraw from a relation he feels is becoming too close or too enveloping. He scares easily.

The eighth and ninth predictive factors indicate the importance of work and of the patient's preparation for it. The tenth factor indicates that we need not fear depression unless it leads to withdrawal.

We are working with a group who have traditionally been alienated from the rest of humanity — hence the old term alienist for the psychiatrist. We are traditionally working with individuals who have aroused fear in others, who could not understand them, and who have been rejected and disenfranchised as human begins. And yet, given human understanding and humane treatment, the rate of recovery is high, and it can be boosted still higher as what we know of scientific treatment is added. But few patients can regain their human qualities in isolation. It takes the experience of positive interaction with others — others who are warm enough to be interested, skillful enough to promote interaction and mature enough to recognize the patient's human needs to promote his recovery. This is the work to which we are dedicated.

PSYCHOPHARMACOLOGY USES STRANGE SOURCES FOR RESEARCH MATERIAL

The giant octopus of Puget Sound and "enzyme factories" in mice are playing a part in a Veterans Administration research attempt to assist in "tailor-making" better drugs for mental illness and other diseases. From these animals come key substances for studies at the psychopharmacology research department at the VA's psychiatric hospital in Sepulveda, Calif., a suburb of Los Angeles.

A joint operation of the VA and the department of physiological chemistry at the medical center of the University of California at Los Angeles, this research is concerned with aspects of body chemistry that may determine whether a man is happy or depressed, disturbed or tranuil, and also may be important in high blood pressure, cancer, asthma, and other conditions. In progress are studies of the effect of chemical compounds on learning, behavior, and brain waves in animals.

To find the enzymes (catalysts of biochemical reactions) responsible for the formation of these compounds, the researchers discovered they had to seek strange sources.

One has been the venom glands of the giant octopus found in Puget Sound. The VA gets this from a commercial source.

Another source has been a certain type of transplantable tumor, mast cell tumors, in animals. To obtain these, the research group has set up a mouse colony in which each individual mouse serves as an "enzyme factory."

The laboratories receive support about equally from the VA and from grants made to the VA and to UCLA from agencies such as the National Institute of Health, the National Mental Health Association, the American Heart Association, the American Cancer Society and the Army Chemical Center.

THE EFFECT OF EARLY AND LATE PHYSICAL RECONDITIONING FOLLOWING KNEE SURGERY

WILLIAM M. BRENNER, M. ED.

KARL K. KLEIN, F.A.C.S.M., F.A.P.M.R.*

The purpose of this research is to study the effect of exercise on post-operative knee cases when progressive exercise procedures were placed into practice early as compared to the effect of long delayed progressive exercise following operative procedures. It seems logical to believe that early progressive exercise following surgery is the positive sequence to be followed if the patient is to get back into activity at the earliest possible time. We have found many post-operative cases that were never exposed to such a pattern and although the surgery was considered a success, the subjects experienced considerable insecurity in function and were unable to return to participation with the safety and security of muscular support. According to our available records a very large percent of the early physical rehabilitation cases returned successfully to participation and competition with no adverse results. Records also show that the majority of late physical rehabilitation cases never did return to competition or really active participation in activities until after their physical reconditioning experiences in the Physical Education Rehabilitation Laboratory here at the university.

If we evaluate this problem in terms of muscular strength losses and gains and to look at the problem of strength loss as it is experienced in post operative procedures we have to realize that the development of strength or the restoration of strength has to be approached from the standpoint of the potential physiological capacity of the musculature that is involved. From this standpoint one also has to realize that the thigh musculature (quadriceps and hamstrings) of the leg that supports the knee joint has a high strength level probably exceeded only by the gastrocnemius. As a result, activities of a general nature or even low resistant exercises can hardly be expected to redevelop these muscles to a high strength level. This is evident by the strength measurements of the cases involved in this particular study because the late rehabilitation cases have little difference in starting strength levels than the early rehabilitation cases, and a number of the late cases have been exposed to various types of exercise previous to the time that they came to the laboratory.

The two study groups were made up of cases with varying time lapse from the operation to the time of specific physical rehabilitation as follows:

Group A, 22 cases with a mean time lapse from operation to specific exercise of 2.5 months. The subjects had a mean age of 19.4 years with 12 left and 10 right operative knees.

Group B, 23 cases with a mean time lapse from operation to specific exercise of 33.5 months. These subjects had a mean age of 19.8 years with 11 left and 12 right operative knees.

The specific progressive exercise techniques used in the physical rehabilitation were variations of the 10-10-10 system (1, 2) and the Bench Technique of progressive exercise (3, 4).

Strength measurements for all subjects were made with the tensiometer and pre and post exercise tests were administered to determine progress and strength balance. The chief criteria for program completion was the development of bilateral strength balance between the involved and uninvolved leg. The strength criteria was a composite score of both the quadriceps and hamstrings. If the bilateral balance was not high enough, as arbitrarily determined, then the subject would be continued in bilateral exercise for an additional period of work in order to raise the total bilateral strength. The measurement figures used in this study for reporting were determined at the point of bilateral balance.

Analysis of the Data

As the population was chosen from a group of college students largely in the freshman and sophomore years, there was no significant difference in comparing the group on the basis of age. On the basis of time lapse from operation to the time of specific physical rehabilitation significant differences existed resulting in a "CR" of 8.6 which was well beyond the .01 level of confidence.

Each group, A and B, was divided into involved and uninvolved sides, and comparisons were made on the intra and inter group basis. Within both groups there was a significant difference between the involved and uninvolved sides. However, the differences between the intergroup involved and uninvolved legs proved to be insignificant on the basis

*Associate Professor and Supervisor, Physical Education Rehabilitation Laboratory, Dept. of Required Physical Education for Men, University of Texas.

	Mean Starting Strength	Intragroup Critical Ratio	Intergroup Critical Ratio	.01 Critical Ratio
Group A		4.04	involved leg	2.69
involved leg	329		1.92	
uninvolved leg	404			
Group B		2.93	uninvolved leg	2.69
involved leg	308			
uninvolved leg	371		.99	

Initial and Final Group Scores — Subdivided by Involved vs Uninvolved Leg

TABLE I

of statistical evaluation. For example, the mean scores obtained for the involved leg in Group A was 329 tension pounds, which was significantly different from the mean score of 404 tension pounds for the uninvolved leg. The same was true in Group B. However, the difference between the 329 for the involved leg of Group A and the mean score of 308 for the involved leg of Group B is not a significant difference. Table I presents the results.

Examination of Final Strength Scores

As suspected at the beginning ot the study post-operative strength imbalance was maintained to a significant extent unless specific reconditioning attempts were made. It is observed that although Group A has a mean higher strength imbalance than the late-starting Group B, the actual difference in starting strength was not significant. Only 16 percent of the initial imbalance remained in Group B while 23 percent of the beginning imbalances remained in Group A. This difference proved to be insignificant upon statistical evaluation. However, even if a significant difference between the final strength imbalances had existed, the difference could possibly be attributed to the lesser amount of initial imbalance in Group B, rather than better response to physical rehabilitation procedures. Actually more imbalance was eliminated from Group A, possibly for the same reason. Table II presents the results.

The large amount of strength imbalance which persisted in Group B up until the time of physical rehabilitation, an average of 33.5 months, indicates a definite need for early reconditioning. It appears that early reconditioning is just as effective, and therefore any ill consequences (such as the greater possibility of re-injury in participation or functional use or the instability caused from weakness and imbalance) which is present in these post-operative cases could be quickly eliminated.

Conclusions

This study has shown that, for the particular population, it did not matter when the physical rehabilitation was begun by post-operative cases. The early and late starting groups made similarly significant strength gains. Group A, the early starting group, and Group B, the late starting group, appear to have been similar in all aspects tested expect for the time lapse between knee operation and the start of their rehabilitation training. These groups were established

	Mean Initial Imbalance	Initial S.D.	Initial S.E.M.	Initial Intergroup C.R.	Initial Final Intragroup C.R.	Mean Final Imbalance	Final S.D.	Final S.E.M.	Final Intergroup C.R.	Balance Gained
A	75	32.4	7.0	1.3	7.6	17.7	15.7	3.4	1.9	59.3
B	63	38.5	8.2		8.4	10.7	10.4	2.1		53.0

Comparison of Initial and Final Mean Imbalance of Group A and B

TABLE II

purposely for a basis of comparison. Since both groups showed similar initial scores and equally significant strength gains from the reconditioning program it would seem likely that not only was this particular rehabilitation program effective, but the informal exercise, or moderate resistive, which the subjects received previously to their experiences in the Physical Education Rehabilitation Laboratory was less effective in the rebuilding of strength and elimination of imbalance. At least this was true for Group B of the population studied. Its members, after a mean time lapse of 33.5 months, still possessed a significant amount of strength imbalance and leg weakness.

Recommendations

If the problems arising from strength imbalance are as important as the literature indicates, then it would seem advisable, where imbalance exists, to eliminate it by initiating proper reconditioning procedures as soon as possible following an operation or injury.

It is to be noted that in the review of the existing literature related to this particular approach to the problem of physical rehabilitation that similar studies have not been reported. With the broad national concern and interest in this problem of knee injury in athletics as well as industry it seems that a combination of the two aspects of total rehabilitation should be utilized in the approach to the concepts of total treatment of the person involved with the problem. Certainly the time factor for adequate muscular reconditioning following the injury can not be considered as the reason for giving only partial exercise treatment. Mass studies in the Physical Education Rehabilitation Laboratory, University of Texas, have shown that of three exercise systems used to date, the minimum mean total time for one month was 2 hours and 20 minutes and the maximum total time was 2 hours and 45 minutes. Of this time factor the actual time spent in exercise of the specific muscle groups was from 1 hour and 10 minutes to 1 hour and 33 minutes according to the system utilized. The remainder of time was consumed by rest periods between the exercise sets. Still lesser systems of exercise did not produce the strength increase and balanced results as previously exemplified by the strength imbalance demonstrated by the two groups of the study, especially Group B, that had extended time to build strength through various forms of exercise.

REFERENCES

1. Delorme, Thomas L. and Arthur L. Watkins, *Progressive Resistive Exercise.* New York: Appleton Century Crofts, 1951, p. 7.
2. McQueen, L. J., Recent Advances in the Technique of Progressive Resistive Exercise. *British Journal of Medicine,* 1193-1198, Nov. 20, 1954.
3. Klein, Karl K., Specific Progressive Resistive Exercise as a Mass Technique for Preventive Conditioning and Reduction of Knee Injury Potential. *Jrnl. Assoc. for Phys. and Ment. Rehab.,* 10:6:185, Nov.-Dec., 1956.
4. Klein, Karl K., Preventive Conditioning and Reduction of Knee Injury. *Athletic Journal,* XL: 7, March, 1960.

NEW TEST DEVELOPED FOR MYCOBACTERIUM FORTUITUM

A simplified test which aids in the identification of certain bacteria resembling those which cause tuberculosis has been developed by Dr. Lawrence G. Wayne, chief of the microbiological research unit of the San Fernando, Calif. Veterans Administration hospital. The study, which has been conducted in the research laboratories of the San Fernando VA hospital, involves a number of bacteria which are closely related to the tubercle bacillus but produce diseases which do not respond to the standard TB drugs. These bacteria are referred to as "atypical" mycobacteria.

The studies at the San Fernando VA hospital have developed a simplified test for recognition of one of these bacteria — Mycobacterium fortuitum. According to Dr. Wayne, this species of bacteria may be found in soil and even in the mouths of healthy individuals. The germ may invade the human lung and produce a disease similar to tuberculosis.

In the past, identification of the microbe required performance of a number of tests which took three or more weeks to complete and which few clinical laboratories were prepared to perform. The new technique, called the phenolphthalein sulfatase test, uses one test tube for the culture and provides an answer in just three days. It can be performed in any laboratory with a minimum of materials.

Occasionally, a culture of Mycobacterium fortuitum has been misdiagnosed as a tubercle bacillus, even by experienced laboratory personnel. Dr. Wayne feels that use of the new test will prevent any such errors in the future and will provide an accurate picture of just how prevalent this infection is.

Dr. Wayne stated that at least three other types of bacteria in the genus Mycobacterium can cause a disease which does not respond to the usual drug treatment for tuberculosis. Betwen one and five percent of all patients in TB hospitals today may be infected with one of these unusual organisms.

Because of the need for early recognition of this situation by the doctor, in order to allow for proper treatment, simple rapid tests, such as the one discovered at San Fernando, are needed to identify these bacteria.

ILLINOIS MEDICAL SOCIETY ADDS PM&R SECTION

At the 1961 annual meeting of the Illinois State Medical Society a Section on Physical Medicine was established. The current officers are: Chairman, Louis Schwartz, M. D., Assistant Chief, Physical Medicine and Rehabilitation Service, Veterans Administration Hospital, Hines, Illinois; Secretary, Arthur A. Rodriquez, M. D., South Side Physical Medicine Center, 9145 South Ashland Avenue, Chicago 20, Illinois.

W. T. Liberson, M.D., Ph.D.
Secretary-Treasurer

VA ADDS MORE HANDICAPPED WORKERS TO PAYROLL

The Veterans Administration hired 1,502 physically handicapped persons during Fiscal Year 1961, an increase of more than 20 percent over the 1,249 appointed during Fiscal Year 1960.

Even with normal turnover, this brings the total of handicapped persons on the VA employment rolls to more than 11,000 in the 170 hospitals, 67 regional offices and 91 out-patient clinics from coast to coast.

THE EFFECTS OF WEIGHT TRAINING ON STRENGTH, POWER, MUSCULAR ENDURANCE AND ANTHROPOMETRIC MEASUREMENTS ON A SELECT GROUP OF COLLEGE WOMEN

EDWARD K. CAPEN, Ph.D.*
JOYCE A. BRIGHT, M.S.**
PATRICIA A. LINE, M.S.**

Introduction

Weight training has been shown by a number of research studies to be beneficial in the development of strength, muscular endurance, speed of movement and other qualities. This type of resistive exercise program has been accepted for a number of years as an excellent technique for the physical development and conditioning of athletes.

Although weight training has proven beneficial in many respects, some few research workers have continued to study the effectiveness of training with barbells and dumbbells with different techniques and programs, and also varied physical qualities. There is no particular reason to suspect that women would show different results from men. However, as far as women are concerned, the effects of weight training have not been thoroughly studied. Hence, this study has been undertaken in an attempt to determine the effects of weight training on strength, power, muscular endurance, and anthropometric measurements of college women.

Review of Related Studies

A number of studies have been conducted during the past 10 or 12 years concerning the effects of weight training on various physical abilities. A summary of a selected number of this research has been included.

Chui (4) conducted a study on the effect of weight training on athletic power. He used one group of subjects to perform weight training exercises two to three times a week. A second group did not participate in weight training exercises, but participated in the required physical education program of the State University of Iowa. The results indicated that the subjects performing the weight training exercises increased in athletic power whereas the second group did not show consistent increases.

Capen (3) conducted a study of effect of weight training on power, strength, and endurance of men. Two groups of students were used in the study. One group consisted of freshmen, and the other group consisted of sophomores at the University of Tennessee.

The sophomore group participated in weight training exercises and the freshmen group participated in a strenuous conditioning course. The group of sophomores engaged in weight training showed greater general improvement than did the freshmen group. There were not significant differences in the improvement in muscular endurance or in circulo-respiratory endurance between the two groups; however, both groups exhibited a considerable gain.

In power events the freshmen group had a higher average initial test than did the sophomore weight training group. The sophomore group, however, improved more in the "speed events" than did the freshmen group. This difference was statistically significant.

Masley, Hairabedian, and Donaldson (6) conducted a six-week study to determine whether increased strength gained through weight training was accompanied by an increase in muscular coordination and speed of movement. The writers concluded that strength increased more during the six-week training period than in a similar period of another activity or inactivity. There was a larger increase in muscular coordination and speed of movement by the weight training group than a six-week period of volleyball and a six-week period of inactivity. These findings were statistically significant.

Kusinitz and Keeney (5) used an experimental group for a resistive training program and a control group in regular physical education classes to study the effects of progressive weight training on health and physical fitness of adolescent boys. At the end of the eight-week testing period, the experimental group had increased their ability to do pull-ups, push-ups, the Harvard Step Test, Dodge run, the Burpee test, trunk extension and flexion. The control group improved in the Dodge run, the Burpee test, push-ups, and trunk extension. The authors found that

*Associate Professor Physical Education, Director Graduate Research, The University of Tennessee.
**Instructor Physical Education, The University of Tennessee.

in no case did the control group improvement exceed that of the improvement of the experimental group. Anthropometric measurements increased in the subjects from the experimental group, except for weight and waist girth. The control group gained in height and weight only. The strength gain was indicated by the increase in weights used during the training period for the experimental group.

Calvin's (2) study was designed to investigate the effects of a program of resistive exercise in the form of weight training on the motor coordination of high school boys. An experimental group participated in a program of weight training exercises, and a control group participated in a general program of physical education for a four-month period. Motor coordination tests were administered in the pre- and post-experimental period. Calvin found that the experimental group showed a strong tendency toward a statistically significant improvement in motor coordination over the control group.

The results of progressive resistance exercises for development of strength and hypertrophy was presented in a study by Montgomery (9). Ten girls were used as subjects. These girls trained for six weeks. They exercised one arm slowly without a weight and the other arm with a weight. The mean girth of the arms exercised with weights increased 0.30 inch. The mean girth of limbs exercised without weights increased 0.2375 inch. The mean gain in endurance was measured by the subject's ability to lift a ten-pound dumbbell as many times as possible. The number of lifts for the exercised arm with weights was 15 and the exercised arm without weights was 11.3.

Wickstrom (10) used 64 college men as subjects in a weight training study. Strength and flexibility measurements were taken prior to the study and again after the twelve-week study. Back extension strength, arm and trunk flexion strength were measured using the cable tensiometer test. A modified low-resistance, high reptition system of weight training was then participated in by these men. There was a statistically significant increase in strength and trunk flexion strength. This study showed that a modified system of low-resistance, high repetition exercises gave a statistically significant increase in strength and did not significantly interfere with flexibility.

A progressive resistance exercise program was conducted on obese women subjects at the University of Tennessee to study the effect of weight training on body measurements of these subjects. The greatest decreases were in waist girth and hip girth at the level of the gluteal fold. The upper arm and calf girth measurements decreased less than other measurements. In fat measurements, the greatest changes were in chest front fat. There was little change in back of arm fat measurements (1).

Procedure

Subjects

Fourteen women selected from a group of physical education majors at the University of Tennessee were used in this study. A rather ideal situation for studying the effects of weight training on women was presented in that the selection of women included varied body types and several stages of physical development, since the age range was from 18 to 31 years. In addition, all of the subjects were acquainted with the tests items, which helped in the collection of accurate data. The experimental group constituted their own control group.

The average weight of the subjects was 125.7 pounds, ranging from 114 to 150.5 pounds. The average height was 5 feet 5 inches with the range from 5 feet 3 inches to 5 feet 7½ inches.

Training Program

The training period was conducted three times per week for a period of ten weeks. Initial testing was administered the first week to determine strength, power, muscular endurance, and anthropometric measurements; and final testing was administered the tenth week on the same test items. During the training period, the subjects worked with heavy weights so as to allow few executions. As time permitted some exercises were repeated during each class period. The equipment utilized consisted of 5, 10, and 15 pound dumbbells; barbells ranging from 30 pounds to 100 pounds; swing bars; a padded exercise table for use in executing the prone arch back; and an incline board and a canvas mat to use in the sit-up exercise.

Anthropometric Measurements

Weight was taken with subjects dressed in briefs and halters and recorded to the nearest half-pound (7).

Height was measured with subjects standing with heels, back of hips, upper part of back, and back of head against the wall to which a height chart was fastened. A square was placed on the head to press down the hair. Height was recorded to the nearest half-inch (7).

Chest circumference was measured with the tester standing in front of the subject. The tape crossed the front chest at the level of the xiphoid cartilage. The steel tape was permitted to rest lightly, but firmly, against the chest to prevent the tape from pressing in on the skin. The subject was

	Initial	Final	Difference	t	Level of Confidence
Weight	125.71	126.28	.57	1.14	29.12%
Chest	72.73	73.03	.30	1.25	21.62%
Waist	70.90	71.65	.75	1.32	21.62%
Thigh	53.00	53.28	.28	.88	38.44%
Hip	81.11	82.06	.95	1.67	11.30%
Calf	34.55	34.45	—.10	1.70	11.30%
Skinfold Chest	14.78	14.92	.14	.19	84.46%
Skinfold Waist	16.71	15.71	—1.0	2.20	4.64%
Skinfold Arm	14.00	14.07	.07	.11	92.18%

Anthropometric Measurements*

(14 Subjects)

*The anthropometric measurements were taken as directed by C. H. McCloy, *Appraising Physical Status: The Selection of Measurements.*

TABLE I

	Initial	Final	Difference	t	Level of Confidence
Weight	131.20	132.90	1.70	1.44	23.42%
Chest	75.58	76.16	.58	2.84	4.88%
Waist	70.66	72.66	2.0	1.96	11.62%
Thigh	54.50	54.76	.26	.70	52.26%
Hip	81.62	83.12	1.5	1.5	20.80%
Calf	35.54	35.42	—.12	.76	46.84%
Skinfold Chest	14.20	15.80	1.6	1.14	33.30%
Skinfold Waist	15.60	14.60	—1.0	1.58	18.48%
Skinfold Arm	14.80	13.80	—1.0	.88	41.90%

Anthropometric Measurements

(5 Mesomorphic-Endomorphic Subjects)

TABLE II

asked to breathe normally while the measurement was recorded mid-point between inspiration and expiration (7).

Waist girth was taken at the level of the ilium. The steel tape was permitted to rest lightly, but firmly, against the chest to prevent the tape pressing in on the skin.

Thigh girth was taken with the subject standing with feet about one foot apart, weight evenly distributed on both legs. A level five inches below the trochanter at the left thigh was measured with a skin tape.

Hip girth was measured at the level of the fat pads on the side of the hips near the crest of the ilia. The subject stood facing the tester. The steel tape fit snugly around and crossed in the front, where the reading was taken.

The calf girth measurement was taken with the weight evenly distributed on both feet at the point of the largest measurement of the calf (7).

For skinfold measurement chest front, the tester grasped a double layer of skin and subcutaneous tissue with the thumb and forefinger of the left hand. The fold of the skin was held loosely while fat calipers were applied and held against the skin. The measurements were recorded in centimeters (7).

For skinfold measurements waist, the tester took the measurements in line with the umbilical and the left side of the rectus abdominis muscle. The skinfold was held with the left thumb and forefinger, while fat calipers were applied. The measurement was recorded in centimeters.

While back of arm skinfold measurement were taken, fat calipers were applied and held midway between the acromion and olecranon over the midpoint of the triceps. The arm was straight, and the calipers were parallel to the arm (7).

Strength, Endurance, and Power Measurements

The broad jump test was administered to determine the distance in feet and inches the subject could jump. The best one out of three or four trials was recorded (8).

	Initial	Final	Difference	t	Level of Confidence
Weight	120.80	120.30	—.5	.85	41.90%
Chest	70.08	70.12	.04	.24	85.12%
Waist	68.42	68.74	.32	.44	70.96%
Thigh	51.36	52.34	.98	2.23	9.26%
Hip	78.98	79.00	.02	.01	100.00%
Calf	33.72	33.68	—.04	.89	41.90%
Skinfold Chest	14.20	14.20	0	0	100.00%
Skinfold Waist	15.20	14.20	—1.0	1.0	37.40%
Skinfold Arm	11.60	12.20	.6	1.0	37.40%

Anthropometric Measurements

(5 Mesomorphic-Ectomorphic Subjects)

TABLE III

The pull-up test was given using a special pull-up device for women. The bar for the feet to brace against and the bar for the hands to grasp in executing the pull-ups was adjustable. The position of both bars was recorded for each individual so that the initial and final tests would be given identically. The subject was encouraged to continue as long as pull-ups were correctly executed. A reverse hand grip was used. The body was held at a 45° angle to the floor, while the arms were at a 90° angle to the body. The total number of pull-ups executed correctly was recorded (8).

In the sit-up test, the subject was instructed to lie on her back on a mat, legs extended and feet about eighteen inches apart. Her hands were placed on the back of the neck with fingers interlaced. A partner held the ankles down, heels being in contact with the mat at all times. The subject sat up, turning the trunk to the left and touching the right elbow to the left knee, returned to starting position, then repeated to the opposite side. Total score was the total number of sit-ups executed in a one minute period of time (8).

Grip strength was measured with a grip manuometer. The best score out of three or four trials was recorded for both right and left grip strength (8).

Back strength was measured with a back and leg dynamometer. The best score out of three trials was recorded (8).

Leg strength was measured with a back and leg dynamometer. The best score out of three trials was recorded (8).

FINDINGS

The changes in anthropometric measurements and test results taken at the beginning and at the end of the ten week period of training are discussed below.

Table I shows anthropometric measurements of the total group of 14 subjects.

The results show a slight difference in most measurements. The greatest and only significant difference between the initial and final tests was a decrease of 1.0 millimeters in skinfold-waist measurement with a t of 2.20, which was statistically significant at the 4.64 percent level of confidence.

Table II consists of anthropometric measurements of five subjects who tended to be predominantly of the mesomorphic-endomorphic body type.

From the results of the five mesomorphic-endomorphic subjects, there was a slight increase in waist measurement of 2.0 centimeters, which was statistically significant at the 11.62 percent level of confidence. The chest measurement, which showed an increase of .58 centimeters and a t of 2.84, was statistically significant at the 4.88 percent level of confidence.

Table III shows five subjects who tended to be predominantly of the mesomorphic-ectomorphic body type.

The anthropometric measurements of the mesomorphic-ectomorphic group showed very little difference. There was a slight decrease in body weight, calf measurement, and skinfold-waist measurement, but none of these were statistically significant. The thigh measurement showed an increase of .98 centimeters, which was statistically significant at the 9.26 percent level of confidence.

Table IV shows the results of the tests for strength, athletic power, and muscular endurance of 14 subjects.

It will be noted that there was a considerable increase in the scores on all of the final test items. Leg strength, which showed the largest increase in

	Initial	Final	Difference	t	Level of Confidence
Right Grip	74.86	79.00	4.14	3.54	Less than 1 per cent
Left Grip	62.00	66.42	4.42	2.50	2.66%
Back	230.00	241.78	11.78	1.96	6.68%
Leg	551.78	688.93	137.15	5.03	Less than 1 per cent
Pull-Ups	14.07	17.71	3.64	4.44	Less than 1 per cent
Sit-Ups	32.31	35.14	2.93	3.89	Less than 1 per cent
Broad Jump	71.36	72.66	1.30	2.40	3.20%

Strength, Athletic Power, and Muscular Endurance*

(14 Subjects)

*The right grip, left grip, back and leg strength items were measured in pounds. The pull-up test was measured in total number of pull-ups that could be executed. The sit-up test was the total number of sit-ups that could be accomplished in a one-minute period of time. The broad jump test was measured in inches.

TABLE IV

strength, was statistically significant at less than the 1 percent level of confidence.

The difference in the right grip strength was 4.14 pounds, with a *t* of 3.54, which was statistically significant at less than the one per cent level of confidence; while the left grip strength showed a difference of 4.42 pounds, a *t* of 2.50, and a statistical significance at the 2.66 percent level of confidence. The test for back strength showed a statistical significance at the 6.68 percent level of confidence.

The tests used for combined strength and muscular endurance were the pull-up and sit-up tests. The level of confidence for the gain in the pull-up test was at less than the one percent level. The level of confidence for the gain in the sit-up test was also at less than the 1 percent level.

The broad jump test which was used to measure athletic power showed a gain of 1.30 inches and a *t* of 2.40, which was statistically significant at the 3.20 percent level of confidence.

Discussion and Conclusions

Similar results were found with the group of 14 girls as have been found with men in earlier studies concerning heavy resistance exercises and their effects on strength, athletic power, and muscular endurance.

It is interesting to note insofar as the anthropometric measurements were concerned that few statistically significant changes occurred during the experimental period of 10 weeks; however, a few fairly consistent changes in body measurement did occur, which tends to suggest that possibly if the weight training program were carried on over a longer period of time, *i.e.*, for 6 to 9 months, that greater changes might well have been observed.

After the conclusion of this study, it was interesting to the writers to have several of the subjects comment that their skills in certain sports had shown a rather great improvement, *i.e.*, one girl who participates in a summer softball league claimed that her batting average had risen sharply and that her ability to pitch had shown a vast improvement. One of the subjects who regularly plays tennis claimed that her game of tennis had greatly improved, particularly in the force and accuracy of her forehand and backhand drive.

From these empirical findings, as would be expected, it would seem that weight training also greatly benefits the girl in sports just as it does men in sports; however, additional research is needed so far as the effects of weight training on the improvement of the women's ability in sport skills is concerned.

From the evidence presented in this study, the writers found that a 10-week weight training program for women produces significant physical changes.

It appears that weight training, as practiced in this study, will improve muscular strength, athletic power, and muscular endurance. The gains on these three variables were all statistically significant.

The findings of this study also indicate that weight training will probably produce a change in anthropometric measurements; however, the differences in the measurements of the body changes of the women in this study were not statistically significant.

References

1. Bright, Joyce A., The Effects of a Weight Training Program on Body Measurements of College Women. Unpublished Study, The University of Tennessee, Knoxville, Tennessee, 1961.

Cont'd on P. 180

THE NEW HORIZON IN MEDICINE*

JOHN H. ALDES, M.D., F.A.C.S.**
GEORGE M. VOELLMER, M.A.***

Webster's dictionary defines *horizon* as "the apparent junction of earth and sky," or figuratively, "the range of perception or experience." *New* horizon" implies that this range of perception or experience has changed. Thus, in talking about "The New Horizon In Medicine," I shall have to answer these questions; *What is the new horizon in medicine?* and *What are the forces which have brought about the change?*

This generation has witnessed a tremendous progress in medicine. Great advances in pharmacology have been seen due to thousands of new drugs; in surgery, due to the use of plastics and artificial organs. But when someone said in the Twenties that the study of minute electrical currents flowing in our bodies might some day lead to important findings and developments in medicine, it was probably thought that he was not quite serious. The work of physicists and engineers was at that time not considered of great importance to medicine, nor was it thought it ever would be.

Yet electronics and medicine have had a long acquaintance. One hundred seventy years ago, Luigi Galvani observed how a frog's leg muscle twitched when touched by a scalpel near an electric generator. Galvani and his countryman Volta searched for an explanation of this phenomenon and came to different conclusions. Sixty years later, the search was still on, and the German physicist Helmholtz used electric instrumentation to check and explain the experiment. An electric current apparently generated by a frog's heart was discovered by Johannes Mueller and the Swiss Rudolph von Koelliker, and a capillary electrometer to record these minute heart potentials was employed by Burdon-Sanderson and Page in England, where in 1887 Augustus Waller produced the first electrocardiogram with this instrument. The real father of electrocardiography, however, was Willem Einthoven of Holland who first described the string galvanometer in 1903 and who finally in 1927 received the Nobel prize for his discovery of the mechanics of the electrocardiogram. Since, then, the EKG as an analytical tool has been brought to great importance by men like Sir Thomas Lewis; ever refined, it has become an indispensable tool in the study of cardiac action in health and disease (1,2).

Helmholtz' discoveries led to others. In 1875, Richard Caton in England showed that electrical activity was present in the exposed brain of an animal during rest, as well as during stimulation and motor activity. In 1902, Julius Bernstein in Germany advanced an hypothesis of major importance; that positive and negative ions can permeate certain membranes, forming an electrical cell and producing bioelectricity. He had found the source of the electrical signals in the body. In 1929, Hans Berger published the first record of electrical activity in the brain which was made by a galvanometer through the unopened skull. At that time the deflections were so small that Berger's work was ridiculed, but in 1935 Berger had an electronic amplifer with enough gain to show that the brain of a man has an electrical beat; that this beat originates in neurons; that it changes with age, sensory stimulation, and changes in the physio-chemical state of the body. A year later it was shown that epileptic seizures occur simultaneously with disordered and distorted brain waves, and Grey Walter used the recording of the brain waves to localize brain tumors, while Dusser de Barenne at Yale University started tracing nervous pathways in the motor cortex of the brain (1, 2).

During the Thirties the entire field of electronics expanded tremendously in all directions. World War II channeled the forces to develop urgently needed instrumentation, and since that time the demanding challenges to electronics have increased constantly. Progress was great, but its results did not always reach the field of medicine; few engineers were interested in medical problems, and medical electronic equipment lagged behind, for industry could not expect more than a small return for investments in research on electronic-medical instruments. The decsive stimulus — and the money — were to come from an area entirely unexpected.

---

*Presented at the Tri-Organizational Scientific and Clinical Conference, Indiana University Medical Center, Indianapolis, Indiana, July 14, 1961.

**Director, Ben R. Mayer Rehabilitation Center, Cedars of Lebanon Hospital, Los Angeles, Calfiornia.

***Research Assistant, Ben R. Mayer Rehabilitation Center, Cedars of Lebanon Hospital, Los Angeles, California.

Toward the end of World War II, President Roosevelt addressed a letter to Vannevar Bush (4), Director of the war-time Office of Scientific Research and Development, an institution which in the late President's words represented "a unique experiment of team work and cooperation in coordinating scientific knowledge to the solution of the technical problems paramount in war." In this letter he stated that

> The information, the techniques, and the research experience developed by the Office of Scientific Research and Development and by the thousands of scientists in the universities and in private industry should be used in the days of peace ahead for the improvement of the national health, the creation of new enterprises bringing new jobs, and the betterment of the national standard of living . . . New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness, and drive with which we have waged this war, we can create a fuller and more fruitful life (4).

In response, Mr. Bush organized a number of committees; their report was not made until 1945 and bore the almost prophetic title "Science, the Endless Frontier (3)." It included the recommendation that a national research foundation be established by Congress which would serve as a focal point for the support and encouragement of national science policies. Five years later, in May 1950, Congress passed the National Science Foundation Act.

It is interesting to note that in the first year of operation of the National Science Foundation, Congress appropriated only a small fraction of the amount which was recommended by Mr. Bush and his Committees; this amount was a little over three and a half million dollars. This was due to public reaction to the international and national political situation and the recognition of research toward the progress of science by the public. Appropriations to the Foundation climbed slowly but steadily as Congress and the people of the United States gained confidence in the operation of the Foundation; possibly also, as the result of some dawning recognition on the part of the public of the importance of basic research (3).

In 1955, the National Science Foundation published a National Research Council study on "Soviet Professional Manpower." This study drew a sobering comparison between the training of scientific and technical manpower in the United States and in the U.S.S.R. As a result of these findings, Congress immediately increased the Foundation's funds for education in the sciences. In 1956, the appropriation was raised to $16,000,000, and in 1957, to $40,000,000. In 1959, $130,000,000 was appropriated; this happened in the wake of intense national concern over the Russian "sputnik" and all that it implied. In 1960, the total was close to $160,000,000 (3).

These figures show America's increased concern with the sciences, partly in continuation of earlier interests and efforts, but largely in response to developments in world affairs and the resulting pressure. From financial resources suddenly made available all the sciences benefited; so did medicine, for money was spent not only to develop nuclear warheads and missiles to carry them but also, for example, to gain knowledge of how man exposed to extreme temperatures would survive. Radiation medicine and space medicine came into being; progress made in the Soviet orbit stimulated more intensive research in our part of the world and vice versa. Just recently, President Kennedy proposed that $9,000,000,000 be used for research and conquest of outer space with the aim of sending a man to the moon. The power which controls space may control the affairs of the whole world, and the race for the conquest of space in which we are bitterly engaged may turn out to be a contest for the control of the national destiny. Such efforts will increase our knowledge; a good deal of these dollars as in past appropriations will be spent on research directly benefiting medicine (5).

To conquer space means to send men into space. This undertaking poses not only an engineering, but also a biomedical problem. How can human life be supported in space vehicles and on satellites which circle the earth? To find out about man's physical and psychological potential under such uncommon circumstances as, for instance, days and weeks of confinement to a tiny space capsule moving at high speed, now accelerating, now decelerating, beyond the measure of human experience to date, a great amount of experimentation was necessary and new tools had to be found, for the old ones were too cumbersome. Small instruments are needed to take physiological readings, and transmitters to relay the data back to earth. The physicist, the engineer, the physician, and others had to form a team in order to find the keys to open the doors to desirable stores of information (6, 7, 8, 9). These keys were electronic keys. The wealth of electronic tools which had to be developed and which was developed largely at Government expense for specific purposes is available today to medicine, and tomorrow these tools and new ones still in the making will be as common in hospital wards and operating rooms as are the forceps and the x-ray tube. Every month brings new developments in medical electronics, a field which has received a very healthy stimulus from "outer space."

Only a few of these developments shall be mentioned here.

Electrocardiographs detect, measure, and record electrical potentials generated during contractions and relaxations of the heart muscles. The use of transistorized amplifiers with greater amplification yet without serious increase in the signal-to-noise ratio permit the construction of lighter, smaller, and more rugged portable EKG units. In the past, the only EKG available was that of a patient at rest; with these new instruments which were developed for the "Mercury" program, there are now means of instrumenting ambulatory or exercising patients — important in discovering abnormalities which are only revealed under stress. This is one example of the return the American public is getting from the space program (1, 5, 9, 10).

A three-ounce transistorized transmitter has been developed which is worn around the neck and carried in the pocket. Signals picked up from body electrodes are broadcast to a remote FM tuner which drives a conventional EKG recorder (10).

In the formative stage is a pocket-size electrocardiograph with a flat oscilloscope display; it will have a tiny Polaroid attachment to enable the physician to record any segment of the heart function he desires (5).

In electromyography, action potentials generated by muscles are measured on electromyographs — the EMG. Ultra-quiet transistor-amplifiers detect a new range of extremely weak, high-frequency signals from muscular tissue (10, 11).

Dr. Kantrowitz of Maimonides Hospital in Brooklyn tells of the possibility that a human paraplegic may walk again by means of neuromuscular electronic stimulation. In an experiment a movable wooden model leg was equipped with potentiometers, and the signals were recorded on tape. Then the tape was "played back" to an anesthetized dog, the neuromuscular stimulation coming from the multichannel tape recorder; the result was crude but coordinated walking movements in the dog (18). This is a tremendous step forward, though many problems will have to be solved before it is possible to make the lame walk again, but here is a beginning, and at the end of the road the blind also may see again and the deaf hear again. Immediate goals for this type of bioelectronic research are devices which will enhance muscle power and thus allow some day a spaceman to overcome the effects of excessive gravitational force (19).

Until the advent of transistors, electroencephalography was available almost exclusively in the laboratories of the larger hospitals. Simplicity and reliability of transistor circuits have made the EEG a practical tool for portable application in small hospitals and clinics (10).

New instruments for skin resistance measurements trace skin physiology and galvanic skin response, indicating the psychological state of men in flight — the degree of alertness, apprehension, fear, panic, and placidity (10, 12).

Body, blood, and skin surface temperatures are most commonly measured; both thermocouples and thermistors have generally proven satisfactory till now, but today there are available electronic thermometers of miniature size which will measure and transmit skin, rectal, and oral temperatures simultaneously and allow constant and immediate observation of any changes (10).

A new instrument for respiration measurements has been found to determine the amount of oxygen consumed by the individual and any change in the rate of respiration. A face-type transducer has been developed which detects the flow of air rather than the volume directly (10).

A breakthrough occurred in gastrointestinal measurements. The new "radio-pills" can be inserted or swallowed and lodged in the gastrointestinal tract; they detect and transmit physiological data from inaccessible body cavities and inform on pressure, temperature, pH, enzyme activity, oxygen tension, and also help in localizing internal bleeding (10, 13).

The over-all trend in instrumentation is toward miniaturization. Apparatus gets smaller, more accurate, more versatile, more durable (14, 15). Research is being undertaken on the introduction into the blood stream of a microsensor which is the size of a red blood cell. This instrument will measure blood flow and oxygen-carrying capacity with great ease; it could be developed to measure pH, pressure, carbon-dioxide level, and even carry radiological traces. The microsensor could be encased in a gelatinous matrix having a tiny radio transmitter, the transmission power being supplied by the blood vessels, just as the plasma supplies other cells with energy (5).

Other research is in progress on a television camera and transmitter the size of a thirty-calibre bullet which can be introduced, like the "radio-pill," into body orifices and canals for the exploration of areas not wholly accessible in others ways (5, 14).

The stethoscope is one of the oldest tools in the medical profession; before long, it will be replaced by

an electronic instrument of greater sensitivity which will also allow it to record the sounds for graphic display and objective interpretation. Phonocardiographic equipment providing continuous and instantaneous recordings of beat-to-beat changes is highly valuable in diagnosing heart diseases as well as evaluating therapy for heart conditions.

One of the most dramatic of electronic devices is the heart monitor or pacemaker which was developed about four years ago by Paul Sozoll of Boston. At the patient's bedside or in the operating room, this machine performs like a mechanical physician ever alert for cardiac arrest; it automatically brings back to life the patient whose heart has stopped beating. Within seconds after the heartbeat stops — and speed is essential — the monitor switches on the "pacemaker" and causes a bell to summon a nurse. Through electrodes strapped to the patient's chest, sixty jolts of electricity get the heart to beat normally again. In the near future it will be possible to provide patients with a permanently installed device which will reactivate his heartbeat even while he is walking in the street (16).

Since World War II a great deal of research has been done in the use of ultrasonic therapy; today, ultrasonics is used not only as a therapeutic tool but also as a diagnostic and even as a surgical instrument (10). It is now possible to visualize tumors of the chest, breast, lower bowel, and brain, investigate movements of the heart chambers and valves, and detect certain diseases of the eye. As a surgical tool, ultrasound has been used in conditions of the ear. In neurosurgery it is used in Parkinsonian disease, and it is used to crush stones in the bladder and in the gallbladder tract. Ultrasound is now used in phonocardiographs (17).

A few weeks ago, an elderly patient suffering from hardening of the arteries, walked around a hospital in Los Angeles. "As he paced back and forth, doctors gathered nearly 2,500 miles away in New York's big Coliseum watched the squiggly electronic image of his heart beat racing across an oscilloscope screen (20)." This demonstration was put on for the American Medical Association meeting in New York; it was designed to dramatize to the physician the impressive progress in the field of electronic instrumentation. It certainly opens the field for long-distance cardiograms which can be sent to heart specialists in other parts of the country for consultation.

The phonogram is an instrument which can take the sound off the electrocardiograph and transmit it by phone across town or to another city where consultations can be obtained from specialists for the patient's convenience.

At the present time, an electronic monitoring center is in operation in an eighteen-bed ward at the University of Tennessee Medical Center at Memphis. Transistors taped to the patient are connected to oscilloscopes, alarm lights and buzzers at a central desk in the nursing station; the patient's temperature, pulse, electrocardiogram, and electroencephalogram are being controlled simutaneously. A single nurse can keep close watch over the patient and act fast when danger signals appear. By flicking a switch, for instance, she can take the temperature of 18 patients in two minutes; making the rounds with a conventional thermometer, it would take her about an hour (20).

Electronic monitoring is being used today in the operating room; it enables the surgeon to have a complete and continuous check on his patient's blood pressure, pulse, temperature, respiration, as well as an electrocardiograph and electroencephalogram, both during an operation and afterwards in the recovery room (10, 20, 21). Electronic monitoring is going to be a big help with the shortage of doctors and nurses which we face today and tomorrow (21).

Since World War II a new electronic device has been developed which may well overshadow all other inventions made, and may start a new era of human history; the electronic computer. Computers are used to store and retrieve fantastic amounts of data and to correlate them. It is feasible to place patients' case histories in computers, as well as the complete medical records of an entire population on these electronic storage devices and make them available to any doctor anywhere within seconds. Entire libraries of books and articles can be stored on tape and upon request searched and transmitted in minutes. Some day a phone call from the doctor's office will provide him with the latest literature on a certain medical problem, and days and weeks of research through copious volumes will shrink to a few hours (22). Computers can assist in statistical evaluations; and physicians will find out more than was ever previously known about disease symptoms and their meaning in relation to the reactions of the healthy body. Exciting research is being performed on the possibilities of computers in medicine, for instance, to develop them as aids in diagnosis. For these ends, a complete change in thinking in medicine and biology is involved and already beginning to take place. For the million functions of the organs of the living body mathematical expressions have to be found. Without mathematical precision, the computer cannot operate; with

it, there may be confidently expected spectacular discoveries and developments in medicine and answers to many questions as old as mankind (1, 10, 15, 22, 23). Computer devices are being constantly improved; some day we doctors may find them indispensable tools for a thousand tasks which we cannot even guess at today. The trend toward miniaturization will produce in time a computer the size of a stick of chewing gum (15).

To ignore or underrate the possibilities of this invention is foolish. It is equally foolish to overrate them; they are machines, tools, and nothing but tools. They will some day assist the physician in his work. To say that machines are intended to replace the doctor is to misunderstand their function. Doctors will always be needed. In fact, the need for men and women in the medical profession is growing from year to year; it is already a serious problem that there are not enough doctors and nurses, and the problem is becoming worse. Statistics show that not as many young men and women are applying for medical training as there should be; in 1959, there were over 600 fewer applicants than in 1957. A special report from the United States Surgeon General concludes that the nation's health might be endangered if the present ratio of 141 doctors to each 100,000 Americans decreases. In 1975, 11,000 medical school graduates will be needed annually, but only 9,000 can be expected at best. At that time there will be a tremendous increase in the number of very young and very old patients who require most of the medical care (24). The same applies to the nursing profession as well as the paramedical groups, the physical therapists, occupational therapists and corrective therapists, the social service workers, the psychologists, the vocational counselors, and all the technicians who make up the rehabilitation team. The shortage is great, indeed. A way out *has* to be found.

In looking back on the development of medicine during the last decade and in casting a glance at things to come it must be concluded that one of the most important results will be a longer life span for the individual. The expectation of life and birth has increased sharply in the first half of the century, and as projected, will continue to rise. Between 1900 and 1950, life expectancy has increased by 17.6 years for men and 20.3 years for women. In 1960, there were in this country 17,000,000 persons over 65 years of age, and by 1980 the figure will be 25,000,000 (25).

The medical profession has contributed the lion's share to this development, but still there is an ever greater task ahead. It has a responsibility to all men, and especially to the aged and physically handicapped who need so much help. It is necessary to assist the individual in gaining happiness with longevity. Senior citizens have a right to live and die in dignity, and ways and means must be found to safeguard this right. An essential step in the right direction is the formation of efficient medical research teams composed of engineers and physicists, mathematicians and biologists and physicians so that new possibilities can be explored.

This is a very exciting era, particularly to those in medicine. A Golden Age of Medical Electronics is dawning. The electron heralded the coming of a new day in medicine; it is shaping a new horizon.

REFERENCES

1. The Growth of Medical Instrumentation. Ampex-Readout, 3:4, April-May, 1961.
2. Castiglioni, Arturo, *A History of Medicine*. New York, Alfred A. Knopf, 1947.
   Garrison, Fielding H., *An Introduction to the History of Medicine*. Philadelphia, W. B. Saunders Co., 1921.
3. Bush, Vannevar, *Science, the Endless Frontier*. Reprint, National Science Foundation, 1960.
4. Ibid, p. 3-4.
5. Enloe, Cortez F. Jr., Apes, Astronauts and the Iceberg. *Bulletin of the Los Angeles County Med. Assn.*, 91:13:22-44, July 6, 1961.
6. Traite, M. *et al.*, Environmental Testing of Future Spacemen. *Electronics*, 32:65-69, Oct. 16, 1959.
7. Benson, Otis O. Jr., and Hubertus Strughold, *Physics and Medicine of the Atmosphere and Space*. New York, John Wiley & Sons, Inc, 1960.
8. Randt, C. T. Impact of Space Exploration on Biology and Medicine. *J. A. M. A.*, 172: 663-665, Feb. 13, 1960.
   Barr, Norman Lee and R. B. Voas, Telemetering Physiological Responses During Experimental Flights. *Am. J. of Cardiology*, 6:54-61, July, 1960.
   Waggoner, James N., *Diagnosis of the State of Health of a Man in Space*. Los Angeles, the Garret Corp., Aireserach Mfg. Div., 1960.
9. Hoare, D. W. and J. M. Ivison, Measuring the Heart Rate of an Active Athlete. *Electronic Engineering*, 33: 6-8, Jan. 1961.
   Smith, G. B., Jr., and L. E. Lamb, Vectorcardiography in Aerospace Flights. *Am. J. of Cardiology*, 6:62-69, July, 1960.
10. Bushor, W. E., Medical Electronics. *Electronics*, 34:3:49-55, Jan. 20, 1961; 34:5:46-51; Feb. 3, 1961; 34:8:54-60, Feb. 24, 1961.
11. Bagno, S. *et al.*, Detecting Muscle Potentials in Unanaesthized Animals. *Electronics*, 33:58-59, Oct. 7, 1960.
12. Race Car Crew Tests Biomedical Gear. *Electronics*, 33: 185, Mar. 11, 1960.
13. Bushor, W. E. and M. F. Wolff, Electronics Probes Nature. *Electronics*. 33:84-86, July 29, 1960.
14. Gernsback, H. Microtelevision. *Radio-Electronics*, 31:8: 25, Aug. 1960.
15. Jolliffe, Charles B., New Technology and Medical Electronics. *West Va., Med. Jrnl.*, 57:26-29, Jan. 1961.
16. Segman, R., Medicine Turns to Electronics. *Science News Letter*, 75:218-219, Apr. 4, 1959.
    Skinner, R. L. *et al.*, Blood Pressure and Heart Rate Regulator. *Electronics*, 32:38-41, Jan. 2, 1959.
    Trump, L. D. and Skinner, R. L., Simple Heart Pacer is Highly Reliable. *Electronics*, 32:92-93, Sept. 25, 1959.

    Vath, W. R., Electronic Watchdogs Guard Ailing Hearts. *Today's Health*, 38:52-55, Jan. 1960.
    Inside Chest Heart Stimulator. *Electronics*. 33:87, Oct. 28, 1951.

Cont'd on P. 181

THE EFFECT OF STROKING ON THE WHITE BLOOD CELL COUNT*

LOUIS B. VOGT, B.A.**

Stroking (*i.e.* carrying a uniform pressure from the paravertebral muscles lateral to the spine to the sternum) the six lower intercostal spaces on each side of the human body until an erythema is produced has been said to cause an increase in the white blood cell (WBC) count, and it is implied (1) that the mechanics of this result differs from that by which the simple massage of any muscle mass produces a transient peripheral leukocytosis through the resulting increased circulation (2). However, a search of the literature failed to disclose any data differentiating the two phenomena. It was the purpose of this study to determine whether a difference actually exists in the effects of these two manipulative techniques on the total WBC count in the body.

Method.

Eighteen clinically healthy normal male medical students were randomly divided into two groups, designated as A and B, of nine each. WBC counts were determined twice a day (9 A. M. and 2 P. M.), for five consecutive days, prior to the start of the experimental work, and the mean scores were determined for each subject for each of these times. An individual's mean score was accepted as indicative of his normal base-line WBC count at these two periods of the day.

During the experimental period manipulative treatments as described below were administered to the subjects at approximately 9 A.M. each morning for five consecutive days. WBC counts were taken on each subject three minutes after manipulation and again, about 2 P.M., five hours after manipulation. The counts were obtained by finger puncture and were diluted in standard white blood cell pipettes by the author. All samples were refrigerated until counted, in accordance with the procedure approved by Miller (2). The actual counts were made each afternoon by a licensed, practicing laboratory technician in accordance with the technique described by Miller, who states the error in such methods is approximately 10 per cent. The technician knew neither the identity of any of the subjectss now how any particular sample related to the study.

Each of the subjects in Group A was placed supine on a treatment table. The six lower intercostal spaces were gently stroked with the finger tips. The ribs were not lifted nor was their position altered in any way. Twenty-five strokes were delivered first to one side of the rib cage and then to the other. Particular care was taken to avoid the areas of the liver and/or spleen, since it has been shown (3) that direct pressure to or stimulation of these organs may influence the WBC count.

The subjects in Group B were placed in the same position. The procedure, timing, pressure applied, amount of surface area covered, and other factors involved with Group A were replicated, insofar as possible, with the single exception that the manipulation was applied over the anterior middle one-third of both thighs.

All manipulations were performed in the morning. Oral temperatures were taken each day to signal the beginning of any infectious process which might invalidate the count (4).

Results and Discussion

The mean WBC scores thus obtained are summarized in Table I. The F test for homogeneity of variance for two extremes indicates that all groups were of the same population. ($F=1.18$ and 4.23 respectively; neither are significant at the .01 level of probability.) For the 9 A.M. groups the differences in WBC count increases for the experimental and control groups was less than the measurement error. The same may be said for the 2 P.M. measurements. Because the differences were less than the measurement error, formal statistical procedures were not considered justified.

While it will be observed that the WBC counts taken at 2 P.M. in each group are larger than those taken at 9 A.M., the differences between morning and afternoon scores were within the measurement error. The large standard deviations shown may be due to a combination of instrument error and actual physiological fluctuations within the individual, but the contributions of each of these variables to the total variability cannot be determined with present

*This project was sponsored by the Department of Physical Medicine and Rehabilitation, College of Osteopathic Physicians and Surgeons, through an undergraduate training grant from the United States Public Health Service, and was conducted under the direction of Philip J. Rasch, Ph.D., and William R. Pierson, Ph.D., of the Biokinetics Research Center of that College.

**College of Osteopathic Physicians and Surgeons, Los Angeles, California.

	N	Base-line	S.D.	3 mins. Post Manipu-lative	S.D.	Change	5 hrs. Post Manipu-lative	S.D.	Change
Group A									
9 A.M.	9	7830	2054	8472	2176	+1442			
2 P.M.	9	8792	2639						
Dif.		+962					9550	2015	+758
Group B									
9 A.M.	9	7047	1168	7764	1450	+ 715			
2 P.M.	9	7453	1193				8309	2266	+856
Dif.		+404				727			98

Mean WBC Counts

TABLE I

techniques. It will be observed that the direction of change was toward an increased WBC after manipulation. If it were to be assumed that the actual increases were masked by measurement error, the occurrence of similar increases regardless of the site of manipulation would suggest that a simple transient peripheral leukocytosis was involved.

Summary and Conclusions

The WBC count taken 3 minutes and again 5 hours after manipulation designed to produce erythema over the lower six intercostal spaces was compared with WBC counts taken after similar manipulation over a different area of the body. Neither form of treatment had a significant effect on the WBC count. The evidence suggests that if an actual increase did take place, a simple transient peripheral leukocytosis was involved.

REFERENCES

1. Andrews, J. M. *Manual of Manipulative Techniques.* Los Angeles: College of Osteopathic Physicians and Surgeons, 1959 Revised. P. 5.
2. Miller, S. E. *Textbook of Clinical Pathology.* Baltimore: The Williams and Wilkins Co., 1955. P. 225.
3. Whiting, C. A. *Public Sanitation and Other Papers.* Kirksville: A. T. Still Institute Publication Bureau, 1916. Pp. 312-313.
4. Sodeman, W. A. *Fathological Physiology.* Philadelphia: W. B. Saunders Co., 1957. P. 169.

WEIGHT TRAINING—Cont'd from P. 173

2. Calvin, Sidney, Effects of Progressive Resistance Exercises on the Motor Co-ordination of Boys. *Research Quarterly,* 30:387, December, 1959.
3. Capen, Edward, The Effect of Systematic Weight Training on Power, Strength, and Endurance. *Research Quarterly,* 21:83, May, 1950.
4. Chui, Edward, The Effect of Systematic Weight Training on Athletic Power. *Research Quarterly,* 21:188, October, 1950.
5. Kusinitz, Ivan and Clifford Keeney, Effects of Progressive Weight Training on Health and Physical Fitness of Adolescent Boys. *Research Quarterly,* 29:294, October, 1958.
6. Masley, J. W., Ara Hairabedian and Donald Donaldson, Weight Training in Relation to Strength, Speed, and Coordination. *Research Quarterly,* 24:308, October, 1953.
7. McCloy, C. H., *Appraising Physical Status: The Selection of Measurements.* Iowa City, Iowa: State University of Iowa, 1936.
8. McCloy, C. H., *Tests and Measurements in Health and Physical Education.* New York: Appleton-Century-Crofts, Incorporated, 1954.
9. Rasch, P. J., Studies in Progressive Resistance Exercise: A Review, *Journal of the Association for Physical and Mental Rehabilitation,* 12:125, July-August, 1958.
10. Wickstrom, R. L., The Effect of Low-Resistance, High-Repetition Progressive Resistance Exercises Upon Selected Measures of Strength and Flexibility. *Journal of the Association for Physical and Mental Rehabilitation,* 14:161, November-December, 1960.

RESEARCH CASTS DOUBT ON DIAGNOSIS OF 'MILD' CORONARY THROMBOSIS

"Mild" coronary thrombosis is a much more serious heart condition than has been thought and calls for strict treatment, Veterans Administration research shows.

Other names for this often difficult-to-diagnose sort of heart disease include subendocardial infarction, coronary failure, acute coronary insufficiency, intermediate coronary syndrome, prodromal symptoms in myocardial infarction, impending myocardial infarction, and intramural or nontransmural myocardial infarction.

A study of 94 patients is reported by a VA research group, as part of large-scale VA cooperative research on heart disease which drew on records of patients treated in 33 VA hospitals.

The high "immediate" mortality rate, together with laboratory and autopsy findings, indicate this sort of heart disease should not be considered mild or benign. The "immediate" and post-hospitalization mortality rates over a five-year period were similar to those observed among patients treated for initial myocardial infarction of the usual type.

The research group was made up of Drs. Harold R. Hipp, Owen W. Beard, James S. Taylor, and Richard V. Ebert, of the Little Rock, Ark., VA hospital and the University of Arkansas Medical Center, with Morton Robins, M.S., of the biometrics service of the VA Department of Medicine and Surgery in Washington, D.C. The research group reported their findings in a recent issue of the *American Heart Journal.*

NEW HORIZON—Cont'd from P. 178

17. Pohlman, Reimar, *Die Ultraschalltherapie*. Berne, Hans Huber, 1951.
Proceedings. International Conference of Ultrasonics in Medicine. Baltimore, Williams & Wilkins, 1958. Also *Am. J. of Phys. Med.*, 37:107-236, 1958.

18. Bioelectronics. *Spectrum*, 9:2:44-46, Mar.-Apr., 1961.

19. Ellis, D. and F. Schneidermeyer, *EMG-Input, Open Loop, Control System*. Publication No. 1586, Litton Systems, Inc., Culver City, Calif., 1961.

20. Bylinski, G., Electronics Aids Help Doctors Diagnose Ills, Ease Nurse's Task. *Wall Street Jrnl.*, 64:123:1, June 26, 1961.

21. Blumberg, M. A., *Hospital Automation — Needs and Prospects*. Menlo Park, Calif., Stanford Research Inst., 1961.

22. Nanus, B., The Use of Electronic Computers for Information Retrieval. *Bulln. of the Med. Lib. Assn.*, 48:3:278-291, July, 1960.
Roach, C. J. *et al., Data Processing in the Medical Sciences*. Santa Monica, Calif., System Development Corp., Publ. SP-102, 1959.
Introduction to IBM Data Processing Systems. White Plains, N. Y., IBM Corp., 1960.

23. Bellman, R., *Mathematical Experimentation and Biological Research*. Santa Monica, Calif., the Rand Corp., Publ. P-2300, 1961.
DeLand, E. C., *Some Experiments and Problems in Mathematical Biology*. Santa Monica, Calif., the Rand Corp., Publ. P-2191, 1961.
Ingegno, A. P., Pushbutton Medicine is Already Here. *Medical Economics*, 38:10:70-78 May 8, 1961.
Ledley, R., Digital Electronic Computers in Biomedical Science. *Science*, 130:1225-1234, Nov. 6, 1959.
Pipberger, H. V. *et al.*, Automatic Screening of Normal and Abnormal Electrocardiograms by Means of a Digital Electronic Computer. *Proc. Soc. for Exper. Biology and Med.*, 106:130-132, Jan. 1961.
Rashevsky, N., *Mathematical Biophysics*. New York, Dover Publications, 1960.
Schenthal, J. E. *et al.*, Clinical Application of Large-Scale Electronic Data Procesing Apparatus. J.A.M.A., 173:6-11, May 7, 1960.
Electronics Asist the Doctor. *ISA Jrnl.*, 6:52-53, Dec. 1959.

24. Rusk, H. A., Issues on Health II. *New York Times*, 110: 37647:73, Feb. 19, 1961.
More Medical Marvels — Not Enough Doctors. *Changing Times*, 15:17-18, Jan. 1961.

25. *Federal Council on Aging*, 1961 *White House Conference on Aging; Chart Book*. Washington, D. C., U. S. G.P.O., 1961.

"From Other Journals"

Unless noted otherwise, all abstracts have been prepared by Philip J. Rasch, Ph.D.

Tsuyoski Ueke, On Some Interesting Cases of Sports Injury. *Nagoya Medical Journal*, 5:31-37, August, 1959.

In recent years there has been an increase of bone fractures due to the person's own muscle power and ruptures of tendons and ligaments among sportsmen. Common factors in their cause and mechanism are lack of muscle coordination and lack of training or preliminary exercise. Violent muscular contractions are especially likely to cause fractures at the site of the epiphyseal cartilages. Fatigue may also be a disposing factor.

Lois C. Perkins and Helen L. Kaiser, Results of Short Term Isotonic and Isometric Exercise Programs in Persons Over Sixty. *Physical Therapy Review*, 41:633-635, September, 1961.

This study was undertaken to determine the effects of short periods of exercise on older persons and to compare the effectiveness of isotonic and isometric programs. Five males and 15 females, aged 62 to 84, served as subjects. One group was given isometric exercises for the plantar flexors of the ankle, the extensors of the knee, and the extensors of the hip. The other exercised similar groups by the ten repetition maximum DeLorme method. After approximately six weeks of training the isotonic group showed a 56.9% increase in strength; the isometric an increase of 45.8%. No evidence of joint trauma was observed. Five months later the isotonic group could still lift a mean of 43.1% more than their initial figure and the isometric group could hold 30.8% more than their original figure. The two types of exercise appear essentially equivalent in their intermediate and long range effects.

Editorial, Problems of Joint Movement. *British Medical Journal*, 5239:1598, June 3, 1961.

The mechanical functions of a joint seem obvious, but we are rather ignorant of its biophysical principles. MacConaill's theory holds that fluid pressure is generated by a wedge of lubricant formed by the motion of the surfaces; this pressure supports the load and keeps the sliding surfaces separated on a cushion of lubricant. Charnley points out that this type of lubrication is not suited to joints and suggests that the medium is actually a boundary lubricant, that is one which has an affinity for the surface and provides for motion to take place between monomolecular films of lubricant chemically adherent to the underlying surface. Wright and Johns have concluded that in joint stiffness the major components are elasticity and plasticity. Viscous stiffness, inertial stiffness, and frictional stiffness are relatively unimportant. Scott suggests there is a diurnal variation in the elasticity of connective tissue.

Ellen R. Vanderhoof, Charles J. Imig, and H. M. Hines, Effect of Muscle Strength and Endurance Development on Blood Flow. *Journal of Applied Physiology*, 16:873-877, September, 1961.

While the work capacity of muscles may be increased with training, there is speculation regarding the physiological mechanisms involved. Increases in endurance and strength are not simultaneous and may be unrelated. It has been suggested that an improvement in the blood supply to active muscles is a major factor in developing endurance and that hypertrophy is a major factor in developing strength.

Five male subjects performed 6 sec. maximum isometric hand grip exercises. Five more held an isometric contraction equal to ⅓ of the individual's maximum grip to the point that he could no longer maintain this force. Five more served as controls. A venous occlusion plethysmograph was used to evaluate blood flow.

Both the strength and endurance groups made gains in strength significant at the 5% level. The control group did not change. The strength group made no significant change in endurance; the endurance group improved significantly; the control group decreased. With the endurance group the ratio of "blood flow debt" to total exercise decreased significantly. This suggests significant changes in blood flow response to exercise are associated with improvement in endurance rather than strength. A larger proportion of the blood flow requirement may have been taken care of during the exercise. It is suggested that the vascular bed is capable of opening up to a greater extent during and following exercise as endurance training progresses.

R. Thornell Mauer, Etiology and Treatment of Leg Cramps. *Postgraduate Medicine,* 30:47-50, July, 1961.

Fifty per cent of all persons between 15 and 80 will have painful legs or feet or leg cramps sometime during their lives. Page and Page maintain that the consumption of large quantities of milk causes a decrease in the concentration of diffusible calcium in the blood and an increase in the concentration of inorganic phosphorous. They prescribe a reduction in the ingestion of milk, small quantities of aluminum hydroxide gel to remove some of the dietary phosphorous from the intestinal tract, and the administration of calcium salts free of phosphorous. Static foot deformity appears to be the most frequent cause of nocturnal cramps in young soldiers. Correction of the strain on the anterior and longitudinal arches and of a faulty weight-bearing line produces relief. Leg cramps due to salt deficiency may be relieved by administration of salt. Nocturnal cramps of unknown origin in apparently healthy persons are best treated by oral administration of 0.3 gm. of quinine sulfate at bed time. Other drugs are useful in cramps caused by various kinds of neuritis.

W. H. Gervis, Tennis Elbow. *British Medical Journal,* 5251: 586, August 26, 1961.

Tennis elbow results from overuse of the involved muscles in the semi-flexed position. About 4 ml. of 2% local anaesthetic is injected into the tender spot, and the muscle is loosened in all positions of flexion and extension. Finally it is loosened with the elbow extended, wrist pronated and flexed. The loosening up and full stretch must be maintained.

Editorial, Tennis Elbow. *British Medical Journal,* 5249:439-440, August 12, 1961.

It is surprising how little is known about the pathology of tennis elbow. The lesion probably consists of a minor tear near the origin of the extensor carpi radialis brevis. The initial damage may result from any activity which requires repeated extension of the wrist. The presenting symptom is pain in the region of the elbow and forearm, which may radiate to the hand but which never possesses a paraesthetic quality. The cardinal sign is pain on resisted movement of the radial extensors of the wrist and tenderness localized to the site of the origin. Rest, injection of locally acting steroid preparations into the site of the lesion, and/or manipulation are routine treatments, but surgical intervention may be necessary in exceptional cases.

Richard C. Schneider *et al.,* Serious and Fatal Football Injuries Involving the Head and Spinal Cord. *Journal of the American Medical Association,* 177:362-367, August 12, 1961.

An upward thrust of the faceguard on the football helmet may cause a blow on the cervical spine as a result of the posterior margin of the plastic helmet being driven forward and upward. The resulting dislocation and spinal cord damage appears to be the cause of death in certain football fatalities. Little can be done surgically with such injuries; the remedy lies in preventing them by improving the equipment. The faceguard should be placed closer to the face or eliminated. A breakaway chin strap would permit the helmet to "give" with severe cervical spine hyperextension. A less solid material than plastic would permit some deformation of the helmet and reduce damage to the brain and to opposing players. A skirt of some material should be incorporated in the back of the helmet so that its posterior margin will not be capable of administering a knife-like blow.

R. Margaria, P. Cerretelli, S. Marchi, and L. Rossi, Maximum Exercise in Oxygen. *Arbeitsphysiologie,* 18:465-467, 1961.

Administration of oxygen improves performance in muscular exercise; when the exercise is so severe as to cause exhaustion within a few minutes, the time of performance increases and a lower concentration of lactic acid accumulates in the blood. This is due to a greater availability of the gas. Other factors, such as a higher saturation of Hb or a faster blood circulation, have no appreciable effect.

D. T. Burke, A Practical Approach to the Common Cold: A Preliminary Report. *Medical Journal of Australia,* II:171-172, July 29, 1961.

Most of the features of the common cold are related to overbreathing; if this is controlled, the symptoms are minimized and the course shortened. The malaise is accompanied by overbreathing which creates a secondary malaise. The hyperventilation induces a reflex which is apparently linked to arterial carbon dioxide tension which sustains the cause. This leads to mouth breathing and dryness of the mouth, and cough. The reflex may be blocked by use of certain sympathomimetic amines. The morning hours may be relatively free of symptoms, but the condition grows worse as the day wears on.

The management is bed rest during the afternoon and evening, restriction of activity, increased fluid and CHO intake. The nasal passageways must be cleared and mouth breathing abolished. Hyperventilation is overcome by breathing slowly, keeping the nose clear, avoiding coughing and talking, avoiding exertion, going to bed early, taking aspirin, eating and drinking about every two hours, avoiding fatigue, and remaining indoors at night. If this regimen is followed, the cough is unlikely to develop.

N. V. Zimkin, The Importance of Size of Load, in Rate of Performance and Duration of Exercises, and of the Intervals Between Sessions in Relation to Effective Muscular Training. *Sechenov Physiological Journal of the U.S.S.R.* 46:1000-1012, 1960.

Load, rate of performance, and length of training session are parameters in training. There is a problem in determining the physiological basis for the most effective training regime. Soviet investigators have shown the effectiveness of muscular exercise is directly related to the foregoing factors. The development of strength, speed, and endurance is most effective when excessive physiological strains are not produced. This is also true of other factors. Heavy training may reduce resistance to various stresses even though the ability to exercise continues to increase. Excessively severe exercises adversely affect the functional state of the body; in overtraining a reduction of performance results. Most effective training requires physiologically optimal exercise. Athletes exceed the upper limits of the optimal range which would provide for an increase of nonspecific resistance, and certain vegetative functions may be affected adversely before there is a deterioration in athletic performance. We must determine the conditions which will enable athletes to maintain a state of high resistance to unfavorable factors during training and competition involving considerable muscular and emotional tensions. (Translated by R. Crawford.)

Jerome W. Gersten, Isometric Exercises in the Paraplegic and in the Patient with Weakness of Quadriceps and Hamstrings. *Archives of Physical Medicine and Rehabilitation,* 42:498-506, July, 1961.

Isometric exercises were compared with isotonic exercises under clinical conditions. For triceps, quadriceps, and hamstrings, isometric exercises produced as marked an improvement in isometric tension and in 10 repetition maximum as did the isotonic exercises. The shorter time element, the desirability of carrying out exercises without joint movement, and the ease of carrying out isometric exercises in a home program are distinct advantages. It is conceivable, however, that carrying an extremity through its complete range may be a distinct advantage. Isotonic or isometric exercises may be prescribed with the specific needs of the patient in mind.

Isometric tension and 10 repetition maximum do not measure identical aspects of muscle function. There is no tendency for fatigue to follow isometric testing, whereas there is fatigue with 10 repetition maximum testing. Isometric tension probably depends primarily on cross sectional area of muscle, although central nervous system factors may play some role. Ten repetition maximum is more closely related to endurance factors which involve circulatory changes within the muscles and patterns of innervation.

C. W. Suggs and W. E. Splinter, Some Physiological Responses of Man to Workload and Environment. *Journal of Applied Physiology,* 16:413-420, May, 1961.

Because the mechanical efficiency of the human body is only 20-30% for a given quantity of oxygen to be expended as work, two to four times as much energy must be dissipated as heat. As a result the physiological responses to workload are closely related to those of thermal stresses. The purpose of this study was to describe the response of heart rate, pulmonary ventilation rate, oxygen consumption rate, and mechanical efficiency to workload, temperature, and humidity.

Nineteen male subjects rode an ergocycle at three different work loads. The positive correlation between heart rate and workload implies a relationship between blood flow and oxygen transport. A workload sufficient to cause the resting heart rate to double increases O_2 consumption 6⅓ times. This discrepancy may be accounted for by (1) an increase in the stroke volume, and (2) increase in the quantity of O_2, delivered to the tissues per volume of blood flow. The combined effect is called the oxygen pulse and is equal to the quantity of oxygen consumed per heart stroke. In order to explain the quantity of oxygen consumption observed, the oxygen pulse must be over four times the resting level.

Increase in physiological stresses, such as temperature, humidity, and workload, cause an increase in the heart rate, but the subject cannot partition the total strain into its various sources. At all workloads the effect of temperature decreases as the relative humidity decreases. The temperature effect is greatest at the heaviest workloads. Ventilation rate appears to measure approximately the same thing that heart rate does. The effect of workload is about three times that of temperature on heart rate and ventilation rate. The effects of humidity appear due to its interaction with the temperature.

The conditions for greatest efficiency are low temperature, high humidity, and high workload. With low temperature and low workload, low mechanical efficiency probably results from the fact that the heat supplied by the muscles is insufficient to keep the body warm. Additional heat must be metabolized at the expense of mechanical efficiency. At high temperature and high workload, too much heat is supplied and overheating occurs. Efficiency is reduced by the energy expended in keeping the body cool.

Ralph L. Wickstrom and Charles E. Polk, Effect of the Whirlpool on the Strength-Endurance of the Quadriceps Muscle in Trained Male Adolescents. *American Journal of Physical Medicine,* 40:91-92, June, 1961.

There is a theory that hydrotherapy is contraindicated preceding activities requiring muscular strength and endurance. Twenty high school athletes were studied. Quadriceps strength-endurance was measured by a lower leg extension movement through a 90-degree range of motion with a weight strapped to the foot. Water temperatures and length of time between whirlpool bath and test were varied. A bath at 110°F. produces a physiological effect which requires two hours of rest to permit of equal or slightly better strength-endurance performance. As the water temperature increases, the amount of time required for recovery increases. The mechanism involved is not clear.

Albert B. Craig, Jr., Causes of Loss of Consciousness During Underwater Swimming. *Journal of Applied Physiology,* 16: 583-586, July, 1961.

Swimming under water is exercise during breath holding. In a number of instances in which a swimmer lost consciousness but survived, it was determined that the subject had hyperventilated before the swim. The experiments reported in this paper indicate that the loss of consciousness resulted from hypoxia, not from hypercapnia. The ability to suspend breathing long enough to reduce PO_2 to hypoxia levels depends upon the degree of hyperventilation preceding the breath holding. Exercise also increases the rapidity with which the PO_2 will decrease, and the swimmer's preoccupation with a goal or with competition may affect his perception of the situation.

R. De Marchi, *et al.,* Hemodynamic Variations from Effort in the Athlete. *Medicina Sportiva,* XIV:107-125, March, 1960.

Exceptional work capabilities are regularly displayed by the athlete in the performance of his competitive effort. These capabilities appear to be due to anthropological characteristics and to the singular efficiency of the athlete's muscular activity and biological functions (respiratory, cardiocirculatory, metabolic). It is the latter functions that are developed to an extreme degree and attract the attention of the authors of this article.

The authors take into especial consideration the respiratory and cardiocirculatory functions. The standard test used is the bicycle ergometer test. The trial effort lasts ten minutes. The results are as follows:

Respirations—at rest 16, maximal 26.

Pulse—at rest 70, maximal 90.

Blood Pressure (systolic) effort increment 35 mm hg followed by leveling.

Blood Pressure (diastolic) effort increment 15 mm hg followed by leveling.

Pulse Pressure—average rise 16 mm hg (in boxers approximately 30 mm hg).

EKG—at rest bradycardia, after effort an increase in voltage. Vertical or semi-vertical position of the heart.

Return to rest values in all these tests were achieved within 7 minutes.

Conclusions: The systolic pressure rise is the same as found by other authors. The diastolic pressure rises first from increased peripheral resistance due to muscular contractions and from the increased stroke volume; then it levels off or shows an insignificant fall. The increased P-Q interval is thought to be due to a hypertonic vagus nerve. The increased voltage is physiological. Of all the determinations the return to normal values is most significant, for it will show cardiac fatigue from overtaxation of the body resources.

The clinical tests employed can, then, because of their accuracy, be used in the initial evaluation of the athlete. (Translated and abstracted by M. Rubino.)

A. V. Gandelsman, R. P. Gracheva, and N. V. Prokopovich, Adaptation of Man to Hypoxaemia During Muscular Activity. *Sechenov Physiological Journal of the U.S.S.R.,* 46:989-999, 1960.

Motor activity is accompanied by compensatory intensification of the respiratory function and of the circulation, which prevents the development of hypoxaemia. This adaptation cannot be achieved by prolonged breath holding. In the athlete ECG potentials are of exceptional stability even in the presence of considerable hypoxaemia, whereas in untrained individuals there is a considerable reduction in ECG activity even during slight hypoxaemia. Highly trained athletes are capable of tolerating both pronounced hypoxaemia and hypercapnia and the two may be regarded as manifestations of adaptational mechanisms developed during prolonged training. They indicate primarily the great resistance of the nerve centers to difficult conditions in the internal milieu. Hypoxaemia cannot be explained by inadequacy of external respiration. Circulatory readjustments are of prime importance in adaptation to severe muscular work. This postulates increased resistance to hypoxaemia in the nerve centers and possibly in muscle tissue. The capillary bed expands in the muscles, which increases the time the active muscle fibers are in contact with blood and facilitates utilization of the oxygen in the blood, and in the lungs, which facilitates the work of the right heart. It is possible the accumulation of CO_2 in the blood reduces the excitability of the nerve centers to hypoxaemia. (Translated by R. Crawford.)

Book Reviews

Effect of Sports and Athletics on the Cardiovascular System, by Ernst Jokl. Report, 1961. Paper. 79 pp.

In this booklet, reprinted from Volume 5 of *Cardiology*, An Encyclopedia of the Cardiovascular System sponsored by the American College of Cardiology, our distinguished Contributing Editor Ernst Jokl has brought together the findings of pertinent research reports in English and in German. Much of the latter was unfamiliar to this reviewer, and it is very helpful to have it made available. Jokl's command of the English language is surprising. Usually certain awkward or ambiguous expressions creep in when an individual seeks to express himself in a language which is not native to him, but this author writes as clearly and as well in English as though it were his mother tongue.

Jokl holds that the heart of the athlete undergoes a physiological (as contrasted to a pathological) enlargement, but that neuromuscular fatigue intervenes before the myocardium can be damaged. Oddly enough, the heart actually decreases in size during exercise and the distolic volume does not increase. He confirms that the coronary mortality of physically active groups is less than that of light workers, although it is surprising to find no reference to Montoye et al.'s *Longevity and Morbidity of College Athletes* in this section or in the Bibliography.

If this monograph does nothing else, it should forever lay at rest the specter of "athlete's heart" as a disability resulting from exercise. One important point seldom emphasized elsewhere is the author's insistence on the fact that *athletic efficiency does not preclude the presence of rheumatic or bacterial heart disease*, and that exercise during acute infections may result in serious cardiac involvement. One wonders how many football players in this country have permanently damaged themselves by insisting on arising from a sick bed to participate in the "big game."

This monograph should be read by every corrective therapist, coach trainer, and team physician, and teacher or student of physiology of exercise. Both they and the athletes or patients under their care will benefit from the time thus spent.

PJR

Health and Fitness in the Modern World. (Athletic Institute, 1961. 392 pp. Paper. $4.50.)

This volume is a collection of papers presented at a scientific conference conducted by the American College of Sports Medicine in Rome during the 1960 Olympic Games, under the Chairmanship of Leonard A. Larson. Speakers represented 15 countries, and 46 papers are here reproduced. Fortunately for American readers, they are almost entirely in English; the exceptions are so few that one wonders why they too were not translated. Much of the material will already be familiar to our readers; one paper by Steinhaus has been published in the *Journal of Applied Physiology* and the Campbell-Pohndorf findings were reported at the last anual meetings of both the ACSM and the AAHPER. One by our Contributing Editor Thomas K. Cureton has been reproduced in this *Journal* and another in the *Journal of Physical Education* and abstracted here. Part of our Contributing Editor Ernst Jokl's material will also be familiar.

The text is divided into six sections: Nature of Health and Fitness, Physiology of Human Activity, Psychology and Sociology of Human Activity, Mechanics of Human Activity, Exercise Problems Needing Research, and International Y.M.C.A. Physical Education Conference. The last, somehow, seems out of place in this book. As the titles indicate, the book will be of interest primarily to teachers and researchers in physical education and only secondarily to coaches, trainers, and sports physicians.

Perhaps the over-all impression which will remain with the reader of this rather mixed lot is the generally unsatisfactory statistical treatment of data collected by European authors. Speakers repeatedly commented that one thing or another was statistically significant without giving the probability, or cited probabilities which were so low as to be meaningless. In other cases no statement was made as to the significance of the reported differences, although in its absence the statement was meaningless. This is not to say that all American research is perfect in this respect—the devastating criticism which our Contributing Editor William R. Pierson has recently levelled at the Smith and Beecher amphetamine study is proof that we too have serious weaknesses in this respect—but on the whole it would appear that many European researchers have much to learn from the New World. On the other hand it is possible that they may be more advanced than we are in research in neural and psychological factors in athletics. It is unfortunate that there were no summarizers to weave the many threads of each section into a whole for those whose primary interests lie in other areas.

PJR

Psychiatric Nursing, Third Edition, by Ruth V. Matheney and Mary Topalis. (St. Louis: C. V. Mosby Company, 1961. Pp. 281. $3.75.)

This text stresses the dynamic approach to nursing, with the material being brought to date by the inclusion of effects of psychotrophic drugs. Basic format is of five units with sub-headings.

Unit 1 — "Personality" considers the evolution of personality. Unit II — "Principles of psychiatric nursing" emphasizes the importance of nursing care through understanding, general principles of psychiatric nursing as related to the nurse and individual patient, and the nurse in the social setting. Unit III — "Nursing care of patient with functional deviate behavior patterns" includes care of the withdrawn patient, the aggressive patient, patients with projective patterns, patients who control anxiety with physical symptoms, and those who control anxiety through ritualistic patterns. Also discussed are patients with socially aggressive patterns, and nursing care as related to the various somatic procedures, including insulin shock and electroshock. Unit IV — "Organic behavior disorders" considers their characteristics and nursing management of patients with acute behavioral, and chronic organic behavior reactions. The final unit discusses "nursing care of patients who depend on emotional crutches," and specifically relates to those who depend on alcohol and drugs. The Appendix contains a condensed A.P.A. classification of mental illness and a glossary. The Index is complete, though brief.

For the nurse who would like to refresh her thinking as relates to modern methods of psychiatric nursing, and for the student nurse, vocational nurse, and nurse's aides this volume may be used as a basic reference on psychiatric nursing.

DCL

Winter Sports and Outing Activities Guide (July 1961—July 1963), edited by Lynn Vendien and Phyllis Ocker. (Washington, D. C.: The Division for Girls and Women's Sports of the American Association for Health, Physical Education, and Recreation, 1961. 128 pp. $1.00 paper.)

This is guide number 10 in the series of the sports library for girls and women and contains articles on skiing, skating and ice sculpture, camping activities, fishing and casting, and hunting and riflery. Each section has a bibliography and list of visual aids, and there is appended a section on standards and rules. The text is apparently intended for women physical education and recreation teachers, and many of the articles are well written. The subject matter is somewhat more than the title implies, for there are articles on how to choose a sleeping bag, mountain climbing, automobile caravans, storage of equipment, and sports medicine. Readers of this *Journal* may find the discussion of skiing and social change to be of interest. Although not included in the present text, articles on archery and bowhunting might be of value to the user of future editions of this *Guide*.

WRP

The Injury-Producing Automobile Accident: A Primer of Facts and Figures, by Robert Wolf, et al. (Cornell: Automotive Crash Injury Research of Cornell University, 1961. 25 pp. Paper, n. p.).

This is a collection of 26 graphs which cover two aspects of the injury-producing automobile accident: 1) various factors directly concerned with the accident itself, and 2) comparisons of accidents in the two-year period 1953 to 1955 with those of the three-year period 1956 to 1959. Although subtitled "A Primer of Facts and Figures," there are no figures and very few facts. The text fails as a means of public communications for three reasons: 1) no data is presented, only percentages, and there is no way to make these percentages meaningful, 2) there is no way to determine the meaningfulness of the comparisons because no probability statistics are even implied, and 3) the graphs themselves are most inadequate. The following are examples of 3) above: In the section "The Vehicles" is a graph titled "Make of Cars." Here Chrysler Corp. is shown with 15.4% on the bar labeled "percentages of 1953 to 1955." Nowhere is there any indication as to whether these are percentages of total number of cars produced during these years, number of cars on the road, or accidents reported in which these makes of cars were involved. In the same section and titled "Body Style of Cars," is a graph which shows that four-door hardtops were involved in 0% of accidents in 1953-55 and 3% in 1956-59. The impression is that the four-door hard-top is becoming less safe, yet as far as this reviewer has been able to determine, there were no such autos produced in 1953-56. The authors state that, "Since the charts are essentially self-explanatory, no interpretations or other text have been provided." The very first graph in the text is absolutely meaningless and uninterpretable.

The authors have made the all-too-common mistake of under-estimating the intelligence of the audience and the result is a collection of over-simplified and "prettied-up" graphs from which no information can be extracted.

WRP

The Story of X-Rays from Roentgen to Isotopes, by Alan R. Bleich. (New York: Dover Publications, Inc., 1960. 186 pp., $1.35, paper.)

This is a very informative book, written in non-technical language. Its 19 chapters seem to group themselves into the following areas: history of radiology, uses and techniques, precautions for radiologists, and an explanation of the opportunities in radiology as a career. The book is well organized, and the 54 illustrations nicely complement the textual material. Of interest to this reviewer were the chapters on the history of radiology and those concerning the non-medical uses of X-rays.

This book is recommended for anyone interested in an over-all picture of the field of radiology.

WRP

The Horowitz Lectures, 1958 and 1959, by Svend M. Clemmesen and Karl Harpuder. (New York: Institute of Physical Medicine and Rehabilitation, 1960. Rehabilitation Monograph XVII. 61 pp. Paper. $1.00.)

This booklet reproduces two lectures by Svend M. Clemmesen and one by Karl Harpuder. In the first, "Surveys of Scientific Basic Disciplines and Open Scientific Questions Within Physical Medicine," Clemmesen discusses the laboratories (clinical, muscle power and co-ordination, electromyography, and gait and muscle function) and apparatus which should be found in the physical medicine department in a general hospital, and the training of the staff. In the second, "Spasm, Spasticity and Rigidity," he deals with these neuromuscular disorders, stressing the value of electromyography and the role of the proprioceptive system. In "Exercise" Harpuder presents a general review of the physiological aspects of this topic, managing to summarize a tremendous amount of material in a few pages. Short lists of references are included. The booklet is well worth reading and is cordially recommended to the attention of corrective therapists and others working in the field of physical medicine and rehabilitation.

PJR

BOOKS RECEIVED

Marine Corps Rifle Exercises — Physical Training Underarms. (N.p., n.d., Paper.)

A drill designed to replace the standard rifle drill exercises. They are said to be more difficult than the older one to make up for the reduction in the weight of the rifle.

News and Comments

MEMBER-EMPLOYEE PROGRAM CITED

Thousands of long-term mental patients are being discharged from Veterans Administration hospitals through a program of hospital job experience for pay. For these veterans, the VA's "member-employe" program is truly the road back. Without it, many would never have made the transition from patient to productive citizen.

There is a producer of television shows, for example, who was admitted to a VA psychiatric hospital two years ago. His progress in jobs at the hospital — from cashier to assistant manager of the hospital's canteen — gave him the experience and faith in himself to return to producing TV shows, at which he excels.

A 48-year-old former WAVE with World War II service, was admitted to a VA hospital in 1958 after her husband's death. She had become progressively depressed during the twelve years she nursed him through an incurable illness.

Psychiatrists at the hospital felt that she might find occupation as an operator of the hospital's' telephone switchboard, a sort of work she had never done. With this job, she improved rapidly. During a bad blizzard last year, she earned a special commendation for manning the switchboard around the clock, when few employees were able to come to work at the hospital.

After nine months as a member-employee, she became a switchboard operator for a large industrial firm. She is earning a living for herself and her young son and has been rated by her employer as an employee he particularly wants to retain.

Together, 43 VA hospitals now have an average of about 575 member-employees on any given day. Thousands of patients have passed through the hospital jobs and on to independent living since the member-employee program was originated by a VA psychiatrist, Dr. Peter A. Peffer, in 1955. The time spent as a member-employee usually is less than a year.

Patients chosen for the program are mainly those with long histories of mental illness and hospitalization, for whom attempts to make the final break from dependency and the hospital environment have been discouraging.

The member-employee jobs are not "made work." Ranging from dental technician to messenger, they are regular Civil Service positions, governed by the same regulations that apply to other VA employees. In addition to salaries, member-employees are furnished quarters, meals, laundry, and medical and dental care at VA hospitals. This enables the hospital to provide the attention the former patients need until they can become independent.

Job supervisors at the hospital help in the step-by-step period of adjustment through which member-employees learn to assume responsibilities and gain confidence in their ability to hold a job successfully again.

Psychologists serving as vocational counselors on the hospital staffs guide patients into the member-employee jobs for which they are fitted, maintain liaison with employers in the community, and help place member-employees in suitable work outside the hospital.

ASSOCIATION HONORS BLIND LEGISLATOR

Representative Criss Cole (center) of the Texas Legislature receiving the Achievement Award of the Association for Physical and Mental Rehabilitation from Julian Vogel, APMR First Vice President, as Rep. Will Smith looks on.

The presentation on August 7 took place in the Texas House of Representatives at a special "Criss Cole Day" to honor a fellow legislator who was blinded by a Japanese grenade on Tarawa in World War II.

Rep. Cole has served four terms in the Texas House and has earned a law degree. The APMR Award was for "achievement in overcoming his handicap and thereby providing inspiration for all."

NEW CANCER FACTS OBTAINED THROUGH CANCER REGISTRY

Veterans stricken by cancer are being treated in Veterans Administration hospitals at the rate of some 30,000 per year. Somewhat more than half are new cases of the disease. In about 40 percent of these, the cancer has been discovered at an early stage, while it is still localized and cure is likely. The lungs are by far the most frequent location of cancers among newly diagnosed VA patients, the skin is second, and the prostate gland is third.

These are a few of the cancer facts just becoming available from the VA Central Cancer Registry, which is the first nationwide registration of cancer patients designed to obtain epidemiological and survivorship information over a period of at least five years. Eventually, the registry will show the results of different kinds of treatment and thus will be of much value in selection of the most promising treatments for wider use and further development.

The information also will provide the basis for studies of rare forms of cancer about which little is known as present.

Tabulation of the reports from the first year of the registry, 1958, has been completed. The figures show the relationships of different kinds of treatment given, stages of the disease, types and sites of the cancers, age, race, sex and geographic factors. Appraisal of the results of treatment in terms of survival or "cure" rates must await follow-up over the years. Of the VA's 170 hospitals, 124 are reporting on all their cancer patients and the others are reporting a 20 percent sample. On this basis, the 170 hospitals reported 26,245 cases of cancer during 1958. VA statisticians estimate the number would have been about 32,000 if all the hospitals had reported all their cancer cases.

Surgery was the most frequently used treatment for these patients. Radiation was often the form of therapy for cancers in selected areas of the tongue, pharynx, esophagus, and respiratory system.

Chemotherapy was most often given for palliation to patients with malignancies of the small intestine, respiratory system, and lymphatic and blood-forming tissues. Hormone therapy was most frequently given to patients with cancers of the breast and genital organs and for selected patients with malignant tumors involving the lymphatic and blood-forming tissues.

DR. SHURLEY NAMED SENIOR MEDICAL INVESTIGATOR

Appointment of Dr. Jay T. Shurley, chief of psychiatry service at the Oklahoma City Veterans Administration hospital, as a VA senior medical investigator has been announced by the agency. The position is for full-time research. Dr. Shurley's appointment is the fifth since the position was created in 1959. Dr. Shurley, who is also professor of psychiatry at the University of Oklahoma School of Medicine, will remain at the Oklahoma City VA hospital engaged in full-time research on mental illness.

The VA's other senior medical investigators are Dr. Oscar Auerbach of the East Orange, N. J., VA hospital, Dr. Samuel H. Bassett of the Los Angeles VA center, Dr. Edward D. Freis of the Washington, D. C., VA hospital, and Dr. Ludwik Gros of the Bronx, N. Y., VA hospital.

Dr. Shurley is known for his research on sensory isolation, in which volunteers remain submerged for hours in a tank of water at the Oklahoma City VA hospital, cut off from the normal world of sight and sound.

In future research, he plans to measure electrically, hallucinations produced by sensory isolation in volunteers. He also intends to use the sensory isolation technique to learn more about the connection between personality and different sorts of mental illness.

Chapter Activities

Central States Chapter

The Central States Chapter of the Association for Physical and Mental Rehabilitation held its Fall two day meeting at the Lexington, Ky. Veterans Administration Hospital on September 29 and 30, 1961. It was co-sponsored with AMRDC and AART.

The conference theme was "Rehabilitation — Projected." Principal speakers and their topics were: "The Organization of Rehabilitation Services" by Richard Wittrup, M.A., Administrator of the University of Kentucky Hospital; "Developing a Community Program for Exceptional Children" by Albert Levy, Ed. D., Coordinator of Special Education at the University of Kentucky; "Rehabilitation Services at Eastern State Hospital" by Logan Gragg, M. D., Superintendent of Eastern State Hospital, Lexington, Kentucky; and "The Structure of Human Performance" by Ernst Jokl, M. D., Professor of Physiology at the University of Kentucky.

Other highlights were the welcoming remarks by W. C. Mitchum, Acting Hospital Director of the Lexington Veterans Hospital and a talk by John E. Davis, Sc. D. depicting the Rehabilitation program in Sweden. There were side tours to the University of Kentucky Hospital and the United States Public Health Hospital. Slides of the National Convention in Indianapolis this past summer were also shown.

Mr. Edward Gharles, C.C.T., and president of the Central States Chapter APMR, was program chairman representing APMR for this fine two day meeting.

California-Nevada Chapter

The California-Nevada Chapter, Evelyn Loewendahl, President, has announced an ambitious schedule of program meetings for the year. The chapter held a meeting on Oct. 5th at which the featured speaker was Dr. William Glasser, Psychiatric Consultant to the California Youth Authority, and author of the popular book, "Mental Health or Mental Illness?" On Nov. 2 the chapter met to hear a talk on "New Horizons in Medicine" by Dr. Cecilia Rosenfeld, who recently returned from a visit to the reasearch centers of Europe, and a discussion of recent physiology of exercise developments from "Behind the Iron Curtain Countries" by Dr. Laurence E. Morehouse of UCLA. The chapter will hold the third in this series on Dec. 7 when the guest speaker will be Dr. Jean S. Felton, Professor of Industrial Medicine at the Medical School of UCLA.

The chapter held a theatre party in Hollywood on Oct. 15th to raise funds for the national scholarship fund.

In the spring of '62, program meetings will be held on "Conditioning in the Space Age," and "Digging Your Graves With Your Teeth." Nationally-known speakers will be featured.

SUBJECT INDEX – Volume 15

ARTICLES

BOOK REVIEWS

AUTHOR INDEX – Volume 15

Classified Directory

Price of Directory Listing for one Year—6 issues—$10.00

STORES WHERE EVEREST AND JENNINGS PRODUCTS MAY BE PURCHASED

PEACOCK SURGICAL CO., INC., 1235 Texas Ave., Shreveport, Lousiana ..... Day 423-5276—Night 868-4910
THE COLSON-MERRIAM CO., 1623 N. Aisquith St., Baltimore, Maryland ..... Mulberry 2847
AMSTERDAM BROTHERS. 1060 Broad St., Newark 2, New Jersey
E. A. WARNICK CO., 123 N. Main St., Wilkes-Barre, Pennsylvania ..... VAlley 2-8064
MARVIN F. POLLARD CO., 411 W. Broad St., Richmond 20, Virginia
CUSACK-HARMON CO., 111 So. 17th St., Omaha, Neb. 341-5825

STORES WHERE EVEREST AND JENNINGS PRODUCTS MAY BE RENTED OR PURCHASED

ABBEY RENTS, 600 S. Normandie Ave., Los Angeles 5, Calif. ..... DU 5-9241; PL 2-3131; RA 3-9571; HO 2-0924; GE 4-0921; TO 6-1714; OX 8-3339; OR 7-6178; CI 3-2101; PO 3-9105; DI 4-7137; OL 2-2760; SY 5-7041; EX 4-3232; KI 5-1181; NA 9-4138
ABBEY RENTS, 2110 El Cajon Blvd., San Diego 4, Calif. ..... CYpress 7-4101
ABBEY RENTS, 1314 Post Street, San Francisco 9, Calif. ..... GRaystone—4-2525
ABBEY RENTS, 2841 S. El Camino Real, San Mateo, Calif. ..... FIreside—5-5775
ABBEY RENTS, 309 Meridian Road, San Jose, Calif. ..... CYpress 3-1276
ABBEY RENTS, 2315 Broadway, Oakland, Calif. ..... HIgate 4-8181; ELgin 7-3944
ABBEY RENTS, 1831 "J" Street, Sacramento 14, Calif. ..... GIlbert—8-9151
ABBEY RENTS, 1500 N.E. Sandy, Portland 14, Ore. ..... BElmont—4-0274
ABBEY RENTS, 4111 Aurora Ave., Seattle 3, Wash. ..... MElrose—3-3222
ABBEY RENTS, 724 W. Indian School Road, Phoenix, Ariz. ..... CRestwood 7-5744
ABBEY RENTS, 1501 E. Broadway, Tucson, Ariz. ..... MAin 2-8821
ABBEY RENTS, 1811 S. State Street, Salt Lake City, Utah ..... HUnter 6-7151
ABBEY RENTS, 350 Broadway, Denver 9, Colo. ..... PEarl—3-5521
ABBEY RENTS, 4041 Broadway, Kansas City 11, Mo. ..... JEfferson—1-5200
ABBEY RENTS, 3230 Washington Blvd., St. Louis 3, Mo ..... OL—2-5700; MI—7-3300
ABBEY RENTS, 2220 Lyndale Ave. S., Minneapolis 5, Minn. ..... FR—4-4680; MI—6-6546
ABBEY RENTS, 2824 W. Fond du Lac Ave., Milwaukee 10, Wis. ..... UPtown—3-2030
ABBEY RENTS, 3545 Reading Road, Cincinnati 29, Ohio ..... AVon—1-7000
ABBEY RENTS, 5326 N. Keystone Ave., Indianapolis 20, Ind. ..... CLifford 3-2741
BEST RENTALS, 2025 S. Shepherd Drive, Houston 19, Texas ..... JAckson—3-4416
DOWD CHAIR RENTAL & SALES, 138 South Highland Ave., Pittsburgh, Pa. ..... MOntrose 1-5355
DOWD CHAIR RENTAL & SALES, 4848 Woodward Ave., Detroit 1, Mich. ..... TEmple 3-3490
DOWD CHAIR RENTAL & SALES, 310 N. E. 61st St., Miami, 37, Fla. 89-8561
DOWD CHAIR RENTAL & SALES, 392 Franklin St., Buffalo, New York ..... CLeveland 3335
DOWD CHAIR RENTAL & SALES, INC., 514 S. Andrews Ave., Fort Lauderdale, Fla. ..... JAck 4-1536
MEDICAL ARTS SUPPLY, 311 State St., S.E., Grand Rapids 3, Mich. ..... GL 9-9413
ELMIRA DRUG & CHEMICAL CO., 368 No. Main St., Elmira, New York 6289
HEYL PHYSICIANS SUPPLY CO., 419 State St., Erie, Pennsylvania 2-6785
BOWERS AMBULANCE SERVICE, 430 E. Pacific Coast Highway, Long Beach 6, California ..... HE 6-9703

MANUFACTURERS OF ORTHOPEDIC AND PROSTHETIC APPLIANCES

BIRMINGHAM ARTIFICIAL LIMB CO., 519 So. 20th St., Birmingham 3, Alabama 3-1786
YALE SURGICAL CO., 1004 Grand Ave., New Haven 11, Connecticut ..... State 7-3005
SNELL ARTIFICIAL LIMB AND BRACE CO., INC., 422 West Market St., Johnson City, Tenn. ..... WA 8-6361

UNCLASSIFIED

NATIONAL SPORTS CO., Mfgrs. of Therapy Gym Mats. 360 Marquette St., Fond du Lac, Wisc. ..... WA 1-8200

LaBERNE THE ORIGINAL WALK-OFF STANDING-TILT TABLE

Model 2101 H

LaBERNE ("Walk-Off") tables built of tubular steel and angle iron finished in Silver Grey Meltone, Mounted on swivel casters with locks, Operated through a gear box and worm, automatically locking the table at any degree of tip. From horizontal to vertical with a calibrated dial showing the degree of tip from 0 to 90.

UTILITY MODEL TABLE is 78" long, 28" wide, and 32" high. Foam top covered with Naugahyde, removable footboard, two 6" restrainer straps, and cervical hook.

LaBERNE TABLES FULLY GUARANTEED FOR 1 YEAR.

Hand Operated—UTILITY MODEL 2101 H $239.50

NEW

MAYO MODEL, 24" wide, 32" high, 78" long, foam top covered with Naugahyde, Removable Footboard and two 6" restrainer straps.

MODEL 2122
Price
$375.00

LaBERNE
UTILITY ELECTRIC
MODEL 1060 E
$395.00

NEW

LOW-BOY, 24" high, 24" wide, 72" long. With Telescopic legs, Foam top covered with Naugahyde, removable footboard, two 6" restrainer Straps.

LOW-BOY MODEL 6200 Price $285.00

LaBERNE MANUFACTURING COMPANY, P. O. Box 5245, COLUMBIA, S. C.